REPORT

OF AN

EXPLORATION AND SURVEY

OF THE

TERRITORY

ON THE

AROOSTOOK RIVER,

DURING THE

SPRING AND AUTUMN

OF

1838.

BY E. HOLMES.

AUGUSTA:
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1839.

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STATE OF MAINE.

IN BOARD OF INTERNAL IMPROVEMENTS,
April 23, 1838.

ORDERED, That the Land Agent is hereby authorized and empowered to cause an exploration and survey of the Aroostook River and its tributary waters the ensuing year, by some suitable person with a particular reference to the settlement of that country and for a water communication between the Penobscot and Aroostook and Fish Rivers.

LAND OFFICE,
May 1st, 1838.

To EZEKIEL HOLMES, Esq. of Winthrop,

Sir:—Pursuant to the above order of the Board of Internal Improvements, you are authorized and requested to select suitable assistants, and proceed as soon as practicable in the above mentioned exploration and survey, which you will finish in such a manner as in your opinion may best promote the interest of the State. You will make a reconnoisance of the Sebois River and ascertain the practicability of a water communication between this river and La Pompique, also between the Little Machias and Fish Rivers, and at such other points on the Aroostook between the St. John and Penobscot Rivers, as you may deem advisable. You will examine the geology and mineralogy of the country, and present in your Report a topographical account of the same—describing the streams, mill sites, mountains, ponds, bogs, &c.; the growth, quality and extent of different soils, and in what direction it will be advisable to open roads and the facilities for making the same. You will notice the climate, in what it differs from the settled parts of the State—the adaptation of that region for particular products—the facilities for boating, and the transportation of lumber, and all such other particulars as you may deem valuable. You are requested to return specimens of minerals and soils to this office with localities designated, and interesting specimens of natural history, such as fossils, bones, horns, shells, plants, seeds, &c., when the same can be done without much inconvenience.

ELIJAH L. HAMLIN, Land Agent.

To the House of Representatives:

In compliance with the request of the House of Representatives of this date, I herewith lay before it, "the Report of Doct. Holmes, upon an Agricultural Survey of the Aroostook, for the year 1838."

JOHN FAIRFIELD.

COUNCIL CHAMBER,
March 21, 1839.

REPORT.

PART 1.

To the Board of Internal Improvements for the State of Maine.

It was thought advisable, the better to fulfil the intentions of the Board of Internal Improvements as expressed in the foregoing orders, to take two different views of the country. One when it was under the influence of the abundance of water in the spring of the year, and the other when under the influence of the frosts and partial drought of autumn. In an agricultural point of view, one could much better judge of the nature and capacity of the soil, and the general capabilities of the country, by examining its features during these two seasons, than by a single view of it in midsummer, when every thing is green and flourishing.

Accordingly, on the receipt of your orders, I repaired to Bangor and made arrangements for the expedition.

In the spring, I was accompanied by Messrs. J. Chace and J. Simmons, as batteau men, and Joe Tomer to manage the birch. Capt. R. Smithwick volunteered to accompany us gratuitously, being

[redacted]

desirous of examining the natural history of that region.

In the autumn, I was accompanied by J. Simmons and Prince Thomas, as boat-men, and J. Babcock, in the birch. Mr. S. A. Jewett, of Pittston, also went with us as assistant.

On my arrival at Bangor, I found the Surveyor General fitting out a company to the same section of the country, for the purpose of lotting out Townships No. 10 and 12, 5th Range on the Aroostook river, and we concluded to put our forces together, and proceed in company under the direction of Capt. Parrot.

Our boats and supplies left Old Town on the 21st of May, and we took stage to Mattawamkeag Point, in order to meet them there and proceed up the Penobscot, it being our design to go up the Sebois, a branch of the Penobscot, carry across the portage into La Pompique, and thence down the Aroostook to the place of destination, viz: No. 10, there make a general depot for our supplies, and each party divide off to perform their respective duties.

Desultory observations on improving the navigation of the Penobscot River.—Reconnoisance of the La Pompique, and portage thence to the Sebois.—Reconnoisance of the Little Machias River, and the portage thence to the Eagle Lakes.

In order to render the Penobscot river safe and easy for boating, two things are necessary;—either to canal from Bangor to the Lakes above, or to

create slack water navigation by means of a series of dams and locks. The latter is much more feasible and economical. The existing obstacles which present themselves to the present navigation of this river, are, the "rips," which are occasioned principally by loose boulders of rocks—and the "falls," occasioned by the occurrence of ledges crossing its bed and intercepting its waters. As a general thing, there is an abundance of water throughout the year for the ordinary purposes of boating in light batteaus, but not always enough to run large quantities of logs and heavy lumber.

The first most important tributary to this noble river, is the Piscataquis, which enters it at right angles on the western side, thirty-six miles above the city of Bangor. The dam and lock at the mouth of this stream, erected by the enterprise of Mr. Miller, if I mistake not, demonstrate the utility of such improvements; and the practicability of them as adapted to these waters, is fairly tested by the ease and safety with which boats and rafts descend or ascend the falls at this place, once so difficult to navigate. Between Bangor and Mattawamkeag Point, no particular examination was made.

The Mattawamkeag enters the Penobscot on the east side, sixty miles above Bangor.

The point formed by the junction of these rivers was not long ago the site of a large Indian village. It is an elevated alluvial plain, and commands three views of the two rivers,—viz: up and down the

Penobscot and up the Mattawamkeag. This last named stream is an extensive one. It in fact drains nearly the whole region of country south of the Aroostook and its tributaries. It is about 320 feet wide at this place, and the Penobscot is nearly 500 feet in width. A short distance above the mouth, as you proceed up the Penobscot, the slate rock crops out on the bank as it crosses the river, but occasions no change in the current. The water between this and "Nickatou," or "crotch" of the river, is very good for boating, but as you enter the east branch, large granite boulders occur, which cause a pretty strong rapid when the water is high. It is sometimes necessary to warp boats by. These boulders may be very easily removed, and as no other cause to produce the rapids is visible, I conclude they would cease on removing them. From this place it is very good boating at the common pitch of water, until you come to the foot of what is called "Ledge Falls." These are caused by slate rocks crossing the river. Here a dam and lock would be necessary. The site for a dam is very good indeed, and as it is a good situation for mills, the expense would undoubtedly be indemnified by the use of the water for that purpose. We found it necessary to warp our boats up here. These rapids are not far from the south line of Township No. 1, 7th Range. Above this the water is somewhat sluggish for some distance, and the boating is good until you come to a place called "Rocky Rips." Here is a strong rapid. It is formed by the slate rock—a somewhat talcose

slate, impregnated with small quantities of lime. The strata run parallel with the river, or rather the river runs parallel with them, and has worn for itself a channel of about 200 feet in width.

The western bank is not very high, but it rises abruptly from the water, while the eastern is much lower. Here is also a good site for mills. Two dams would be necessary to slacken the water, or a short canal might be constructed around the falls. We found it necessary to take out a part of our load and warp the boats up. Above these falls it is good boating for a mile or two, when you come to the foot of "Grindstone Falls." At this place the river has worn a trough through the ledge which is parallel to the course of the current. The banks on each side are rough and precipitous. The slate of which this ledge is composed, like the last mentioned, is somewhat talcose and contains lime. Masses of grauwacke are also found here. The rock is much decomposed and the fragments or "shingle" cover the shores to some extent.

Near the shores, the ledge comes up to the surface of the ground, and there is of course a little soil upon it. There are several good sites here for dams, either for mills or for slack water, or for both. The portage here is about half a mile in length, and the chance for an inclined plane and railway around the falls, is very good indeed. This would undoubtedly be the best and most economical mode of overcoming the obstacles to the navigation of the river at this place.

Above these falls we had very good boating for half a day—say six or eight miles distance, when we came to "Whetstone Falls." The river here crosses the ledge at right angles, which crops out on both sides of the river, and is of the same character as that mentioned above. Here is a very good situation for dams, and also a very good site for an inclined plane and railway around the falls, which I think would be the better way to surmount them. The portage is about half a mile in length, over which we found it necessary to carry our cargo, but the boats were warped up over the rapids or falls.

From this you have a long reach of smooth water which affords very good boating. The country also improves in appearance, for, instead of the burnt trees and sterile rocks which mark much of the country for some miles below, a hard wood growth appears, patches of interval shew themselves, and the upland in the rear of them is evidently of a good quality. This appearance continues until you come to the mouth of the Wassataquick, which enters the Penobscot on the west side. Around the mouth of this stream is a large body of interval land, while on the opposite side, on the east, the land rises gradually into a large swell, covered with hard wood. Two settlers, Messrs. Hunt and Dace, have got very good farms under cultivation here. They are at present the highest up of any on this branch of the Penobscot, and are the last inhabitants that the traveller finds as he proceeds up the river.

It may be well to remark here, that the true Wassataquick is called East Branch on Greenleaf's map of Maine, and the true East Branch is called Wassataquick. The water continues good for boating until you come to the mouth of the Sebois. This branch enters the Penobscot from the east, and takes its rise in several large lakes which are near the waters of the Aroostook.

The land around its mouth is of that description known by the name of low interval. From this place, as you continue up the Penobscot, the water becomes quick and the boating hard, and it continues thus until you arrive at the foot of the "Grand Falls" of the East Branch.

One or two low dams between this and the mouth of the Sebois, would be of essential service in checking the force of the current and rendering it more easily navigated.

When we left Bangor, it was our intention to proceed up the Sebois river, and enter the Aroostook by the La Pompique; but, on consultation with the boatmen, it was thought best to continue up the east branch of Penobscot into Montagamon Lake, thence up Hay Brook, and carry across the portage into Millinoketsis, a lake of the Aroostook. This course, in order to comply as near as I could with my orders, would render it necessary for me to go up the La Pompique from the Aroostook, and across to the Sebois to examine the ground and ascertain the practicability of connecting the two waters. But as the route proposed was thought to be easier

for the men, and would give me a chance of seeing more of the Aroostook valley than the other, I acquiesced in the arrangement and kept in company with them.

The "Grand Falls," as they are called, are a series of falls or rapids, continuing for about two miles through a narrow channel worn in the rocks, the strata of which cross the river and render it formidable and dangerous for boats to encounter. The first pitch of water is near the mouth of Bowling Brook, which is a small but wild and troubled stream entering from the east. The country in this region presents a dreary and barren aspect. Formerly a heavy pine growth existed here, but the fires have swept it away and left the rocks completely bare, except occasionally a blackened and branchless trunk lifts itself up, as if to make the utter desolation of the scene still more striking.

On carefully examining this spot, it is evident that the best, and indeed the only rational mode of overcoming the obstructions which are presented, and which are the greatest in the whole distance from Bangor to the lakes, is by means of an inclined plane and railway. This may be placed on the east side of the river where is a good site for it.

Dams could be constructed here without much trouble, but it would be necessary to have several, and in some of the places where they would be needed the river is too narrow and too much pent up to give room for the locks. At a slack place in the water below the upper pitch, and also at the

upper pitch of water, some lumbermen have constructed temporary dams for the purpose of commanding the water while running their logs down, and they find them to be of essential service in this kind of business.

The rock formation here, is slate intermingled with grauwacke. Boulders of porphyry occasionally shew themselves, and large masses of conglomerate or puddingstone are strewed around in abundance. The granite boulders which we occasionally met with on our way up, have disappeared some distance below.

One of these puddingstone boulders was found by Capt. Smithwick, on the west side of the river, measuring six paces in breadth, seven paces in length, and more than eight feet in height. From the size of them it may be inferred that they have not travelled far from their original location. The mountains at a short distance in the rear, are undoubtedly formed in part or wholly of this kind of rock. We had not time to go to them and ascertain the facts. The boulder above mentioned contained pieces of jasper, and also adularia in small fragments.

Near the head of the falls, on the east side, are found large boulders of secondary limestone. As a similar limestone was discovered by our able State Geologist, Dr. Jackson, last year, on the Sebois, it is not impossible that they are derived from the same formation, and probably, when the country between these two rivers shall be cleared

up, large tracts of limestone formation will be found in place.

After completing the portage of our cargo, and launching our boats once more at the head of the falls, we found smooth, dead, or rather sluggish water, occasioned undoubtedly by the dams which we had passed. This continued for nearly a mile, perhaps more. It then became more quick and so continued until we had arrived at "Stair Falls." This is a rapid, occasioned by a formation of trap rock which crosses the river at right angles with its course, and causes four or five cascades of moderate height, like a low flight of stairs. We found it necessary to warp our boats up them. A dam and lock would be necessary to flow out the rapids at this place. Above this we again came to sluggish water, which continued for half a mile. The scenery as you pass up the river here, shifting and varying at every turn of the stream, is very beautiful. A mile or two above this is a large lake, known by the Indian name, Montagamon, at the foot of which a strong dam has been built. This enables the lumbermen to flow the lake in the spring of the year while they raft their logs down, and also to increase the water below when they open the gates to let their lumber through, thus causing an artificial freshet which assists them in their whole route to the mills below. Half a mile below this dam the water begins to run very strong, and continues to run more and more rapidly until you reach the foot of the dam. A low dam across the river at the commencement

of the rapids, would be of service in improving the navigation of this part of the river, and a lock would be necessary in the large dam at the outlet of the lake, to lift the boats into it.

The Montagamon lake is a large and extensive body of water, containing some fine islands. It is surrounded by some large heights of land as well as by moderate swells. There is in the vicinity a good growth of pine timber, from which some of the finest lumber that now floats on the Penobscot waters is obtained. Here ended our hasty and imperfect examination of the Penobscot. Just beyond this lake we turned out into a small tributary called "Hay Brook," which comes into the stream that connects the Montagamon with the lake above. This brook takes its rise near the head waters of the Aroostook, and enters the Penobscot waters from the east.

The examination, as I have just stated, was both hasty and desultory, as we were anxious to get to our place of deposit as soon as possible, and could not detain the men and boats for the purpose of taking admeasurements or looking minutely into all that offered worthy of examination. It has established, however, in my own mind, the importance of improving the navigation of the river, and convinced me that it is perfectly feasible. And I would respectfully recommend, that at as early a day as possible, the Board, by consent of the Legislature, should order a thorough and critical survey of the Penobscot river with a view of ascertaining :—1st.

A more complete topographical knowledge of it; and 2d. What would be requisite for, and the cost of rendering it boatable with ease and safety.

Indeed it is a matter of astonishment to me, that, while many other of our water courses, by no means to be compared with this noble stream, have been surveyed by skilful Engineers, this, which has contributed and still contributes more than any other one, to the strength, the wealth, the prosperity and importance of our State, has hitherto been totally neglected. There is no river in Maine that waters such an extent of country, or flows through such a diversity of soil as this. Every step therefore in improving it, would tend to bring the interior nearer to the focus of trade, and be opening as it were an additional avenue to the resources of our country, and thereby foster its growing powers. Population would then, instead of crowding our seaboard, or hovering around our already thickly settled towns, stretch itself forth into what is now the wilderness, clear for itself new farms, and build new towns and villages, knowing that the communications to a market were open at all times, and feeling that they were not wholly isolated from the rest of the human family.

If no other improvements could be effected, it would be a praiseworthy object for the State to assist in constructing good roads over the several portages around the several falls. Let such roads be properly and permanently made—camps or buildings of a cheap but durable kind erected at

suitable distances, and strong hand carts or trucks placed there for the use of those who need.

This would be a great convenience for those whose business may lead them up the Penobscot. Perhaps this may appear like an idle scheme to many, but there cannot be the least doubt, that, had the State done these things fifteen years ago, they would have yielded more than ten per cent. interest on the cost of construction and repairs by the very saving in labor and time spent in getting supplies and men to and from the public lands, for surveys and explorations and other necessary expenditures connected with the care of the public domains, while the benefits and savings to private enterprise would have been immense. One unacquainted with the facts can hardly have a conception of the severe labor that men undergo in carrying boats and supplies over these portages, or "carrys," as they are called.

Every thing must be done by main strength, and that cannot always be laid out to the best advantage. Oftentimes they are compelled to pick their way, where, though frequently crossed before, there is not a sign or vestige of a footstep or path, and where a slip of the foot, loaded as they are, would be inevitable death. It is true, that the men usually employed in this work are hardy and inured to the business, but this is no reason why they should be compelled to continually act as beasts of burden, when a little assistance from the State would change the routine of operations, and make what is now

a most laborious and oftentimes hazardous task, one of comparatively easy performance.

We found Hay Brook to be a crooked stream, at first skirted with larches, or hacmatacks, as this growth is most commonly called. After leaving this growth, you find the course of the stream lies through a tract of "Brook Interval," forming a natural meadow, from which hay is annually taken to supply the teams of lumbermen. This circumstance probably gave the name to the brook up which we were passing. After passing these meadows, on the right bank, you find the slate rock cropping out and running in nearly an easterly direction, while its strata are nearly perpendicular, both of which are circumstances not in conformity with the direction and dip of the rock further below.

Soon after this, you come to a ridge on the left, of sandy soil covered with a thrifty growth of Norway pines. At the south point of this ridge there is a small rapid, where would be needed a dam about two rods long, and a lock. After you pass this the stream widens and becomes more sluggish, and continuing on for about half a mile further, you come to another rapid, more strong and much longer than the last. The stream here forces its way for thirty or forty rods through a narrow passage in the rocks, and is so obstructed with windfalls and loose rocks, that we found it necessary to unload the boats of their cargo and carry it by, but the boats were warped up, lifting them occasionally over the obstacles which choked the channel.

It would be necessary to construct at least two short dams with locks, in order to slaken the water, and to clear out the loose rocks and logs which lie in the way. Above this place, the stream becomes much more serpentine or winding, and the boats are also impeded in their progress by the alder bushes, which, growing on each side, lean over to nearly a horizontal position across the water. There appears to be a good supply of water, and the channel may be very much improved by straightening it by digging a new channel. The soil being alluvial will allow this to be done very easily. With the exception of windfalls and leaning alder bushes, no other obstructions exist until you come to the portage or carrying place between this and the Aroostook waters. This portage is upon a gradual swell of hard wood land, and is *two hundred and eighty-six rods in length.* On the northerly side lies "Millinoketsis," a beautiful lake about a mile in length, and two or three miles long. At the head of this lake lies a large bog, which bends around the foot of the swell of land, and through which a passage might be cut into Hay Brook. For reasons hereafter to be given, I do not however consider this the most eligible place for connecting the Aroostook and Penobscot rivers.

The Millinoketsis empties itself into a dead stream forty or fifty feet wide, which continues thus for about two miles, when it becomes somewhat narrower and more rapid in its current. It also becomes choked with windfalls and jams of

logs, and the sides are skirted with leaning alders, which obstruct the passage of boats very much.

These alders grow to the length of twenty or thirty feet, and being loaded with snow during the winter, become fixed in nearly a horizontal position. Their branches become interwoven with those of the opposite side, and thus cover the waters of a stream in some places forty feet wide, and are a serious impediment to boatmen, especially when their leaves and branches are wet. The borders of this stream are also covered with cedars, "pumpkin" and sapling pines, &c. It continues to be occasionally encumbered with windfalls until you come into the next lake, Millinoket, and in order to improve it for boating, it will be necessary to construct two dams between these two lakes, by which to flow out the rises that are found—to clear out the channel by taking out the loose rocks and windfalls, and to cut away the tangled growth on the sides. The average width is about forty feet, and its average depth is not far from three feet.

Millinoket is a large sheet of water, surrounded on all sides by ridges and swells of land which are covered with a mixed growth of hard and soft wood. This land offers, as far as the eye can judge at a distance, tracts of good soil for cultivation. Proceeding in a northeasterly course you enter the outlet, which for half a mile is a broad, smooth stream. You then come to a slight rapid, encumbered with a jam of logs and windfalls, forming an

obstruction across the whole stream. It would be necessary to cut and clear out these, in order to open the channel.

Below this we found one or two small "rips," and occasionally the obstructions before mentioned, viz: windfalls and bushes, lodging across from bank to bank. After passing these, we came to still water again for half a mile, and then entered the main Aroostook. A dam at the head of this slack water would probably flow back into the lake, and thus render it boatable from the main river to the Millinoket.

We found the waters of the Aroostook swollen to a high pitch by the rains which had poured upon us most generously on our way up, and they swept our boats along with a strong but smooth current.

About a mile above a branch, called the Mooseluck, we came to a formidable rapid which continued for some distance. Here we came very near losing one of our boats by its striking a rock. On visiting the spot again in the autumn, when the water was very low, we found the cause of this rapid to be a dyke or wall of puddingstone conglomerate crossing the river at right angles. A small island is formed in the middle of the river. The narrow channel is on the right as you pass down, and in the left channel between the island and the main land is this perpendicular "ledge," extending across and forming a natural dam. It is five or six feet thick and four or five feet high. In the spring of the year, during the freshets, the water rushes over it with

great force. It is from this undoubtedly, that the boulders of puddingstone which are found so abundantly on the Aroostook as you coast down it, were derived. There is, however, no very bad rapid in the river below this until you come to the Grand Falls, about two miles or more from its mouth.

Reconnoisance of the La Pompique.

After depositing our supplies at the camp, in No. 10, we returned up the Aroostook for the purpose of examining the La Pompique, or, as the Indians pronounce it, La Bombique, and the land between it and the Sebois.

The La Pompique is a comparatively small stream, entering the Aroostook on the south side, in township No. 9, Range 7th. Its banks are low, and encumbered with alders and leaning bushes, which obstruct the passage of boats. Jams of logs, and loose boulders of slate-rock and puddingstone, also obstruct the navigation of it, and make one or two portages necessary for the purpose of avoiding them. No ledges or rock formations were observed, in place, all being loose and easily removed. The volume of water which passes down it, in ordinary seasons, is sufficient for the common purposes of boating in this region, which is with batteaux, but in times of drought it must be rather low and occasion difficulty to get up or down it. Near the head of the stream are two branches, which by being

cleared might add much to the amount of water. The distance between the La Pompique and the Sebois Lake is two thousand five hundred and forty-eight feet, or one hundred and fifty-four rods nearly. The land on the margin of the Sebois is quite low and wet, and by digging a canal of moderate depth, it might be brought ten or fifteen rods nearer the La Pompique with ease. The land between the two waters is a low tract covered with a cedar, fir and spruce growth.

On taking the level across we found the La Pompique to be seven feet, seven inches and nine-tenths higher than the Sebois.*

There would be no difficulty in forming a canal between the two on account of the nature of the soil, as there is evidently no rocks of any consequence or other obstacles to render digging difficult. One lock only would be needed.

The expense of constructing a canal and lock might be estimated at

Viz: Digging and removing, say 23029 cubic yards of earth, at 10 cents per yard,	$2,302 90
Constructing lock,	1,500
	$3,802 90

An objection however, meets you on the threshold which renders the policy of constructing a canal across exceedingly questionable. From appear-

* The plan and profile of the route across is deposited with the Board of Internal Improvements.

ances, and such indications as could be observed, I am led to the conclusion that there would be hardly water enough in the La Pompique to serve as a feeder. The branch of the La Pompique which comes nearest to the Sebois arises in a bog and is rendered sluggish in its current by an old beaver dam below. It is possible that if a high dam were built below the mouths of the two tributaries, a sufficient supply might be obtained. It is doubtful, however, in my mind, if a canal, even could that be effected, would be the better medium of communication. A railroad, under all the circumstances, offers the best mode of overcoming the difficulties. The distance is short—there is plenty of lumber upon the spot, and the ground for most of the way not unfavorable.

The cost of railway in the aggregate may be estimated at $2,400; to which add—

Clearing the La Pompique and constructing cheap lock, ...	2,000
Contingencies, ...	600
	5,000

Making the whole cost of improving the boat navigation from the Aroostook into the Sebois, five thousand dollars. The distance from the one to the other, following the La Pompique, is probably from twelve to fifteen miles.

The question next arises whether a well constructed turnpike road between the two waters would not answer every purpose. A good road,

properly made and drained might be constructed for \$1000;—but allowing it to cost \$1000, the connection may be made between the two rivers (Sebois and Aroostook) for \$4,000.

The utility of doing this must depend very much upon the practicability and amount of cost of overcoming the obstacles presented by the falls of the Sebois below. Of this I am not able to speak, not having seen them. At present this course is quite a *thoroughfare*, notwithstanding the severe labor required to pass through it. The travel, however, through here, will be somewhat diminished by the finishing of the Aroostook road, but still there will always be travel here, and when the section of country in the vicinity becomes settled, as it one day will, (and that day may be essentially hastened by a little liberality and exertion on the part of the State) the travelling on this route will increase in the direct ratio of its population.

The articles of transport for many years, must be, supplies for lumbermen—agricultural produce—merchandize, and the lighter kinds of manufactured lumber, such as shingles, clapboards, staves, &c. Heavy lumber, such as logs, timber, &c., cannot easily be brought up stream. I can see no other course for these than such as nature has pointed out, viz: down the Aroostook and St. John rivers.

The Sebois lake is a large deep body of water, surrounded on the north and west by high swells of land covered with a mixed growth, indicative of good soil for agricultural purposes. The La Pom-

pique, at a little distance from its banks, is also bordered with similar swells. Improvement in the navigation of these two streams would induce settlers to enter upon the lands. The limestone in this region might also be mentioned as affording a source of profit, could the means of transportation down either river, or both, be rendered more easy than at present. Nature seems to have pointed out what might be done here to advantage, leaving just enough unfinished to stimulate man to industry and energy in completing it. The experience of other States demonstrate the utility of internal improvements of this kind, as connected with the lasting prosperity of the State itself.

Reconnoisance of Little Machias, and Portage to Eagle Lake.

The Little Machias enters the Aroostook on the north side, in No. 11, 5th Range, about twelve miles below the mouth of the St. Croix, another branch which enters in No. 10, same Range. It is a very serpentine stream, but the bends or crooks are short.

Its general direction is northerly. For a mile and a half from its mouth, the water is quite rapid, and affords a very good mill site, which I understand is taken up and about being improved for this purpose by an enterprising citizen of Augusta. After passing up this distance, there is a long reach of still water continuing for nearly or quite ten miles. This

brings you within a mile and a half or two miles of the Little Machias lake. Here you again meet with rapid water, and another good mill site. The growth on the banks is principally what is known here by the name of black growth, that is to say, pine, cedar, spruce, fir, &c. There is little or no larch or hackmatack found here. The upper half of this river runs through low interval land, such as is best known to our farmers by the name of "brook *interval,*" though it is a little more sandy than that kind of interval is generally.

The margin of its banks is crowded with a thick growth of alders, such as has been heretofore described. The pine growth is more abundant here than on any of the other branches which we have described, though not quite so large as some on the main river, owing probably to its having been culled over, as, judging from the camps and logging roads which we occasionally met with, the lumbermen had been there operating undoubtedly on their own high responsibility. No ledges or rocks appear there in place, but loose boulders prevail near the upper part, especially near the lake. They are of the same character as those before mentioned, such as slate, pudding stone, &c. The Little Machias lake, through which this stream passes, for we found that it continued further north, is about three miles long, and perhaps a mile and a half wide, and extends in a direction west by north. It is surrounded with ridges of a moderate height, covered with a hard wood growth. At the upper

extremity of this lake, on the northeast shore, is the portage from this to Eagle lake, which is the uppermost lake, or source of Fish river, and the first of an extensive and interesting chain of lakes, stretching to the northeast nearly parallel with the St. John river, and reaching, as we were informed, to within fifteen or twenty miles of the Grand Falls. Of this we are not certain. It is pretty certain, however, that they have never been explored by any Agent of the State, and all that is known respecting the easterly part of them is derived from the French at Madawaska, who have fished and hunted in and about them.

The portage above mentioned is two miles and three eighths long, and passes over a beautiful swell of hardwood land. This swell sinks gradually to the west, and again rises, thus forming a low valley, which affords a very eligible site for a canal, rail road or turnpike, for facilitating the transportation between the two waters.

On perambulating the valley, I found a brook running into the Little Machias. This continues up to nearly the summit level between the two waters, when it suddenly turns to the left, or westerly. This, should it be needed, would make a good feeder—from this angle in the brook commences a natural meadow, about forty rods in length. A thick growth of firs and spruces next appear, and continue for some rods, when another brook shews itself, running into Eagle lake.

On taking the level through this valley, I found

the waters of the Eagle lake to be *twenty-three feet* higher than those of the Little Machias.* The distance between the two is 11,880 feet, or two and a quarter miles.

Eagle lake is a large, deep body of water, crooked in shape, being made up of two arms nearly at right angles to each other, and the distance is probably, from one end to the other, from twelve to twenty miles. The width is variable, say from one to four miles, and it affords at all seasons of the year a vast volume of water.

The nature of the soil between the two lakes is mostly alluvial, and the growth is made up of cedars, firs and spruces. There would probably be found nothing to make digging difficult, and every advantage is offered for the construction of a canal, with locks. The cost of improving the Little Machias and connecting it with Eagle lake, may be estimated at $17,092 50.

To improve the Little Machias, a dam and lock would be needed at the mouth, and another just below the lake. The loose boulders removed, jams and windfalls cut away, and also the alders upon the banks—the stream straightened by cutting across the little peninsulas, or "ox bows," as they are here called, and occasionally a jettie or wing dam put down to deepen the channel in places where it is broad and more shallow. This I think may be done for $2000.

* Plan and profile of the ground are deposited with the Board of Internal Improvements.

Excavating and removing 118,925 cubic yards of earth for canal at 10 cents per yard, ...	$11,892 50
Constructing three wooden locks,	4,000 00
Wooden pier or breakwater in Eagle lake, ...	200 00

An inclined plane and railway would be less expensive and equally as good, perhaps better. Setting the improvements of the Little Machias as before, at $2,000, and two miles and a quarter of railway at $11,250, the total expense would amount to $13,250. The distance from the Aroostook river to Eagle lake cannot be less than fifteen miles. The inclination of the railway, except for a few feet at each end, where it dips into the water, would be so gradual and slight that no fixed engine would be needed, and horse power would be amply sufficient to transport loaded boats of considerable burthen from one lake to the other.

Should it be thought, however, by the Board, that the expense of a canal or rail road would be too great for the amount of transportation which would probably be done upon the other, I would respectfully suggest that a good road between the lakes would come within the scope of economy, and at the same time answer a good purpose for facilitating intercourse between the two sections of country. By winding around the foot of the swell of land, over which the portage now passes, a level track might be secured, and very good roading found.

The distance would probably be thus increased to three miles, and a good turnpike might be easily constructed over this ground for $3,000, which, with the $2,000 for improving the Little Machias, would amount to $5,000 for fifteen miles of water and land communication. Or, should greater economy be desired, and less amount of improvement accomplished; by omitting the cutting through the "ox bows," building jetties and removing all the boulders, the remainder might be done upon the Machias for $1,000, and the sum total for fifteen miles of very good communication would then amount to but $4,000.

Should the line of the contemplated Aroostook Road, from the Aroostook river to Madawaska, be changed, as it undoubtedly ought to be, so as to run upon the swells and settling lands in the vicinity of Fish river, the above expenditure would be amply repaid by the saving of labor and time in getting in supplies for that work through this improved way.

Should either of the above plans of internal improvements be adopted, you can then have, with comparatively trifling additional expense, a complete thoroughfare by water from the settlement on the Aroostook river to Madawaska on the St. John, a distance of fifty miles or more, and that too through your own territory.

This additional expense will consist in erecting a few dams with locks in the streams that connect the several lakes on the way to the St. John.

In order to ascertain more fully what would be probably necessary for the purpose, and to learn what would be the probable benefit of such improvement, we proceeded, during the fall excursion, down a part of the lakes to Fish river, and thence into the St. John to Madawaska.

The upper Eagle lake has two branches, one bearing northwesterly and the other easterly. Proceeding down the easterly branch, you come to a broad outlet, which, for a mile or two, has a gentle smooth current. This stream is estimated to be nine or ten miles long. The average depth at the time we descended it, was about three feet—width varying from thirty to eighty feet. After descending three or four miles, we found that the slate rock forms a flooring to the stream, presenting the edges of the strata for some distance, but there are no falls or rips of any consequence. Occasionally there is a little quick water, but nothing to retard the progress of the boats either way. A couple of dams at suitable distances from each other, with locks, would make the stream deeper and slacken the water the whole length. As you approach the second lake, the stream becomes more serpentine, and patches of very good interval shew themselves on the banks.

The second lake is not far from four miles in length, and from two to three in breadth. At the upper part it is bounded on each side by high swells of land, but towards the foot the land is more low.

The stream connecting this lake with the next, or third lake, is estimated to be three miles long. The water is not so deep as the last mentioned stream, but it is broad, and the current not very quick. The most rapid part is near the outlet of the second lake, where is a suitable situation for a dam. The third lake is a large body of water, and is made up of two branches—one stretching in a curving direction to the east, and the other a little west of north. It is not always observed when the lake is entered, and strangers are apt to continue down the easterly branch on their way to the St. John, when they should take the other, or the left hand branch as the lake is entered.

The easterly branch cannot be less than six miles in length, and receives, near the foot of it, a large inlet from other lakes further east, which we did not explore.

As I have just observed, the left hand branch leads into Fish river, and is the direct way to the St. John river and the Madawaska settlement. This branch of the lake is three miles long. The waters are deep and abound in fish of various descriptions. The French people from Madawaska resort in great numbers to this and the other lakes, especially in the fall of the year, for the purpose of supplying themselves with the fish found here. The large lake trout, or togues, as they are sometimes called, abound here—also the kusk, a fish somewhat similar in appearance to the salt water kusk. The kind most sought after, however, is

called "white fish." I did not have an opportunity of examining any of them, and cannot say to what species they belong. We were informed by a Frenchman whom we met upon the lake, fishing for togues, that there was a party then in the lake next east of us, taking the "white fish"—that they caught them at night by torch light with dip nets, and that it was the work of but a short time to load a horse—that they were about half the size of the common alewife or herring, and of very good flavor.

Fish River which connects this lake with the St. John, and indeed is the outlet of the whole chain of lakes, is at least fifteen miles in length. It is of very uniform depth, being on an average, at the time we were there, about four feet deep, but it is evident, from the marks on trees growing on its banks, that at times it is swollen to no mean dimensions, and that at such periods a large volume of water flows down its channel.

As you enter it from the lake, you find a few boulders in its bed, which cause a slight rapid; but which would cease on their removal. There are but two very serious obstacles to encounter between this and the St. John river. One of them is the "Grand Falls," about three miles from its mouth, and the falls at Maddock's and Savage's mills, a mile below these. At the Grand Falls, the water plunges over the rocks almost perpendicularly, twelve or fifteen feet. The best mode of overcoming this obstruction would be to construct an

inclined plane and railway about fifty rods long, as the river is so narrow and the rocks (which are slate) form a rugged shore through which it would be too expensive to dig a canal. At the milldam, a lock might be constructed without much trouble, or an inclined plane and railway made around the dam of about twenty rods in length.

As my orders did not authorize me to go into a minute examination of any other section of this route, than between the Little Machias and the *Upper* Eagle Lake, I did not take any admeasurements, nor make so critical a survey as to enable me to give an estimate of the probable cost of improving the navigation of the streams which connect the lakes with each and with the St. John. However, the exploration which I did make, convinces me that with comparatively little expense, these natural channels may be easily improved, and by constructing one kind or the other of the works which have been mentioned, a complete communication, principally by water, of not less than fifty miles in extent, may be opened between the Aroostook and the St. John rivers—thus uniting the settlements on each of the rivers, and in fact, establishing a direct and safe thoroughfare to the frontier parts of our State.

Indeed it is not a little surprising that something of the kind, either in the form of a canal or a good road, has not yet been done. On the St. John is a settlement of more than four thousand inhabitants, belonging most rightfully to the State of Maine;

and on the Aroostook another, comprising in all not less than five hundred—citizens of the same Commonwealth as ourselves, bound to support our government, amenable to our laws and entitled to our protection—and yet, hitherto there has been no established means of ingress to, or egress from them, unless you pass through the territory belonging to Great Britain.

Surely it is no wonder that our boundary is not settled, when we have not even made so much as a footpath in which to go and see where it is; and have no means of visiting that portion of our fellow citizens who live upon our borders, except by groping our way through the trackless forest or crossing the dominions of a foreign power.

The advantages of a direct communication to Madawaska, setting aside the duty of every State to establish and keep up a complete line of communication to every part of its territory, would be the opening of a new field for the enterprise of our citizens, and bringing much of the trade of the fertile valley of the St. John to our own doors. But this is not all. At a time when a portion of our territory is actually under the jurisdiction of Great Britain, it is a more serious and important inquiry, how—should we be driven to the extremity of a resort to arms—how can we enter to defend or regain? How could soldiers or munitions of war be transported to this section of our frontiers—where it is sufficiently difficult for the hunter, inured as he is to the toils and the labors of a life in the

wilderness, to travel with his pack and birchen canoe across the route in question ?

Surely the wholesome admonition of experience —"in time of peace prepare for war"—has been strangely disregarded by us, as it respects this portion of our territory, more especially when we consider that the very preparation required would be thrice more useful in time of peace, and largely contribute to the abiding prosperity of this portion of our domain.(*a*)

PART II.

Situation and Extent of the Valley of the Aroostook. Climate—Soil—Natural growth—Agricultural products—Roads recommended—Geology. General remarks.

THE Aroostook, or Restook River, as some call it, rises in several lakes which are located very near the Eastern waters of the Penobscot. Lakes Millinoket and Millinoketsis are the principal sources from which it flows. Its general course is easterly, and it forms one of the most important branches of the St. John. It is very serpentine in its course, and hence, with its tributaries drains a greater extent of territory than it otherwise would, amounting to not less than fifty townships, or 1,152,000 acres, comprising in its valley some of the very best soil in the State of Maine.

The waters of this river are very little interrupted with falls or "rips" until within about three miles from its mouth, when it becomes obstructed with rocks which cause a precipitous fall estimated by some at from fifteen to twenty feet in height; though from slight observation, it appears much higher than that. The rocks cross the river here at nearly right angles, and cause a series of cascades which continue nearly a mile and afford a very romantic and picturesque scene.

The waters of the Aroostook, as has been before observed, move moderately and smoothly, except when they are swollen by freshets in the spring. They are however, boatable for common batteaux all seasons of the year, except when obstructed by ice. Large boats, drawn by horses walking on the shore, in the same manner as canal boats are drawn, are also used when the water is at a suitable pitch, but in the drought of summer it is somewhat difficult to move up and down with boats of any considerable size.

Tributaries. The principal tributaries or branches of the Aroostook are as follows: beginning at its mouth and following upon the south side, Presquile, St. Croix, Umquolqus and La Pompique. On the north side—Limestone Stream, Little Madawaska, Salmon Stream, Beaver Brook, Little Machias, Great Machias, Mooseluck. Most of these streams, like the main Aroostook, are not very rapid. They are occasionally crossed by the strata of slate or greywacke which sometimes make obstruction ; and a pitch or descent of water sufficient to form a mill privilege is the result.

There is one peculiarity to be found in nearly all the places suitable for mill sites. It is quite seldom that both branches of the stream are of the same character. One side, for instance, will be formed by the ledge while the other side falls off, being made up of alluvial (interval) land, which render it very difficult to make a dam that shall be permanently tight on that side.

This characteristic is exhibited at Mr. Fairbanks, on the Presquile, and in several other situations. At Mr. Pollards, on the St. Croix, this is not the case. Both sides of the river here present a strong ledge. We did not ascend the Presquile above Mr. Fairbanks.

St. Croix. The branch next in course and importance is the St. Croix. This enters the Aroostook near the centre of No. 10, 5th Range, near the point where the Aroostook road strikes the main river. It arises principally from a lake in No. 8, although some of its smaller branches extend into the No. 7's of the 4th and 5th Ranges. It passes through a good timber tract of land, and there is also some very good land for agricultural purposes upon its banks. Lumbering will probably be the order of the day upon it for many years. There are two good mill sites upon it. One in the corner of No. 9, which has been taken up by Mr Pollard who has been engaged in erecting a very excellent saw and grist mill there.

The other is in No. 8, a few miles higher up the stream. The waters of this river abound in fish. And it is thought that some of its branches might be connected with those of the Mattawamkeag so as to form a communication by water to the Penobscot.

Umquolqus. The next most important stream above this is the Umquolqus which rises in No. 7, 6th range, from two small lakes. This is not so large a stream as the St. Croix. It takes its name,

as the Indians say, from a species of duck which remains there during the winter. We did not see the duck while we were there, and cannot therefore determine what particular species is meant. For the first eight or ten miles from its mouth, it is a rapid and wild stream when there is any thing of a freshet. Above this it is somewhat sluggish. The land through which it flows is varied in its character. On the west side, as you go up, is a tract of land covered with mixed growth, rising gradually from the banks and forming a beautiful swell, possessing undoubtedly a good soil for farms. Higher up the stream the land is lower and covered with a fine growth of larch (hackmatack,) spruce and cedars. On this stream are one or two good mill sites, but the lumber for several miles from its mouth has been cut off *with* or *without* leave and carried away.

Near the source of one of its branches in township No. 7, 6th range, is a large formation of limestone.

La Pompique. Next above this last named stream, is the La Pompique. The source of this branch, as we have remarked in another part of this report, is only one hundred and fify-seven rods from the Sebois Lake, out of which the Sebois branch of the Penobscot flows. It is rather a small and crooked stream, much obstructed by loose rocks or boulders, windfalls and leaning alders. It is often used, in the spring and fall, by those who come up or down the Sebois, in passing to and from

the Aroostook. Indeed it was formerly the principal avenue to the Aroostook from the Penobscot country.

In the drought of summer, the water is shallow. The land through which it flows is rather low and swampy, though there are swells of good land at a little distance. It is well stocked with trout; and water fowl breed in considerable numbers near its source. Its name, I am informed by the Indians, signifies in their language, a rope.

LITTLE MACHIAS. The Little Machias is the only branch of the Aroostook on the north side, which we were able to explore, and for a description of this, must refer to the first part of our report.

The Aroostook country may be considered as lying between 46 and 47 degrees of north latitude.

SOIL. The soil of this region is various. Much of it is alluvial. By alluvial, however, is not always meant that species of soil that is known by the name of *interval;* but by alluvial I here mean that kind of soil which has been deposited by water in a quiet state, and although all *interval* or *bottom* lands are alluvial, being deposited by water in this state or condition, yet all alluvials are not strictly speaking *intervals.* Some disappointment was experienced last summer, by many who visited the Aroostook with the idea that the alluvial land, which Dr. Jackson spoke of in his report, was the same as that known in other parts of the State, particularly on the Kennebec, Sandy, Androscoggin and Saco Rivers, as altogether *interval* lands.

Although there is a good deal of this species of land there, yet the alluvion is much of it "*upland.*" Such appears to be the formation of the soil in many of the townships which I examined, particularly letter F, upon which Mr. Dennis Fairbanks resides. This is one of the best townships in the whole valley of the Aroostook, and has been proved to be first rate for crops, especially for wheat. An analysis of the soil of Mr. Fairbanks's farm, was made by Dr. Jackson, and published in his report of the Geology of the Public Lands. Some soil taken by me in the forest, a mile or two from Mr. Fairbanks's house, yielded on analysis similar results, excepting it afforded a trifle more (5. parts and $\frac{3}{10}$ in the hundred) of vegetable extract (geine), a result which might naturally be expected. Some taken near the same place, but from a locality in which cedars (Thuya occidentalis) flourished, contained still more *geine* than the other.

There are many tracts or belts of *interval* scattered up and down the river which are very good. The arable portion of them is not so wide as has been thought, for, as a general thing, they sink rather too much as they recede from the river. On the Kennebec, Sandy, Androscoggin and Saco Rivers, the intervals generally rise as you proceed back from the banks of the river into table or high lands, but here the high lands are most often found on the opposite sides of the river. It is true that this peculiarity does not always show itself where intervals

occur, but in a majority of cases this will be found to be the fact.

These intervals are at first fertile, and afford good crops, but it will probably be found that they are much more liable to be affected by early frosts, and in process of time, when it shall become necessary to manure, they will prove less retentive of such dressing.* The best soils for farms are undoubtedly on the gentle swells of land covered with a mixed growth of hard and soft wood; and although the intervals and the lower lands will be valuable for tillage and mowing, yet the swells are much better adapted for pasturage and more likely to be supplied with wholesome water.

The tract of land lying between Houlton and letter F is mostly a moderate swell of a quality similar to letter F, and indeed much of the whole country between the Aroostook River and the Houlton Road is of this character. It has been asserted that there are an unusual quantity of bogs or lowlands in this country. From a careful inspection of the lands bordering on the whole length of the river and several of its tributaries, I do not think that this is the case. It is true, that in a territory where there are no very high mountains which give rise to streams, the waters must collect in what are called *bogs*, and many of the streams take their rise in such places, others start from lakes. The amount of these low lands compared with the number of

*The intervals here spoken of are seldom if ever overflowed by the river.

acres of good soil, capable of making first rate arable or grazing farms, is not out of proportion; nor do I think there are more of them than the inhabitants will, at some future day, wish there were. It may seem exceedingly visionary to some, and appear like looking forward to a very far distant day, when the inhabitants of this section of our State shall consider these lowlands as among their most valuable property; and yet, by turning our eyes to the older countries, we find such to be the fact there, and learn that similar lands are sought after with avidity, drained and cultivated with great success and profit.

GROWTH. The forest trees of this region are similar in kind to those in other northerly parts of the State. Among them are found the following, viz. Norway pines (*Pinus Rubra*), Pumpkin, or as it is most often called, White Pine (*Pinus Strobus*), Hemlock (*Abies Canadensis*), Spruce (*Abies Nigra*), Silver Fir (*Abies Balsamifera*), White Maple, White Birch or Paper Birch, Yellow Birch, Beech, White and Black Ash, Elm, Red Oak, Iron or Lever Wood, Wild Cherry, Cedar (White Cedar *Thuya Occidentalis*), common Poplar, Canada Poplar or Balm of Gilead, Basswood, &c.

In the bogs and lowlands is found the Larch, or as it most commonly called Hackmatack, and there are some large and extensive tracks of this valuable tree, now so much used in shipbuilding. They grow large and thrifty. The common Cedar of this country, which is the White Cedar—Arbor Vitæ or *Thuya Occidentalis* of Botanists—is also abundant

in such places, but what is a little uncommon, by far the best specimens of this tree are found on the uplands, and in some of the best soils. When in such situations, they grow up straight and thrifty, whereas, when found on the low lands they are much more apt to be crooked or to form a curving trunk. This fact puts Michaux's assertion, that this tree *never grows on high land,* entirely at fault. He says "It is never seen on the uplands, among the Beeches and Birches, &c. but is found on the rocky edges of the innumerable rivulets and small lakes which are scattered over these countries, and occupies in great part, or exclusively, swamps from 50 to 100 acres in extent some of which are actually accessible only in winter, when they are frozen and covered with several feet of snow. It abounds exactly in proportion to the humidity, and in the driest marshes it is mingled with the Black Spruce, the Hemlock Spruce, the Yellow Birch, the Black Ash and a few stocks of the White Pine."

From the above account one would suppose that it was impossible to find this tree except in some inaccessible bog; and indeed, the general belief is, that whenever one of them is seen you may find a cold stone and a cold spring of water at its root. Yet some of the best and most productive land, the soil of which on analysis affords as many valuable materials as any in the State, and when cultivated actually produces as good crops as any other, supported before being cleared, a dense growth of these trees. The Fir tree also, as well as the Spruce,

has taken the liberty to grow as well or better here on the intervals and uplands, than they do in the swamps. Many of the intervals, which, when cleared, afford a warm dry soil, were covered with the Silver Fir, Spruce, &c.

The Hemlock is not quite so plenty here as in some other parts of the State.

White Pines are found mingled with the hard-wood growth, and the most valuable and splendid specimens of this tree occur interspersed with such trees on the swells and uplands.

The Rock Maple is very abundant and affords large quantities of sugar to those who are disposed to enter into the business.

The Yellow Birch acquires enormous size here and affords some fine timber, a considerable quantity of which is cut on the St. John and sold.

The Beech is abundant in some places, but whenever you find it prevails you will also find a hard and stony soil.

In the low lands, Elms and Black Ash abound; White Ash is not very abundant, though in some sections it is found in considerable numbers. A few trees of Red Oak were found on Eagle Lake, but Oak of any kind is not often found in this section. The Pines and Spruces seem to be the only kind of timber now in demand on the Aroostook. The Pine timber found here, is undoubtedly superior to any in Maine. But very little is yet manufactured in mills, it being nearly all hewn or made into ton timber in the forest, and floated down to Fredericton

or the city of St. John and thence shipped to England. The Larch for knees and timber for ship-building, and the Cedar for fences, railways and other purposes; Birds-eye Maple, Birch, &c. for cabinet work and many of the purposes in the arts will, at no very distant day, come into demand, and whenever the call is made an almost inexhaustible supply may here be found. There seems only one draw back to their value. There is no other way by which these productions of the forest can be sent to market except down the Aroostook and St. John rivers—thus subjecting us to the necessity of going through or into a country belonging to a foreign power before they can be disposed of.

CLIMATE. Although this section of country is situate in a pretty high latitude (between 46° and 47° N.) The climate is not so severe as in some situations on the same parallels, owing no doubt to its interior location and to the fact that it is not mountainous. The surface is undulating or lying in swells, and although some of these swells rise into hills, yet they are of a good soil and well wooded to their very summits.

Snow falls early and continues upon the ground somewhat late in the spring, which prevents the ground from freezing very deep in the fall or winter, and from "heaving," as it is termed, in the spring, by frosts.

As a general thing, the frost penetrates but three or four inches and can be broken through with very little force any time during the winter.

The early fall of the snow may be attributed to the existence of so large a body of wood, covering the earth for such an extent unbroken. It cannot but be the case that where there is such a dense covering to the soil as so much foliage affords, and where there is so much evaporation constantly going on, a general moisture and coolness of the atmosphere must be the consequence, and also a much lower state of temperature than if none of these causes existed.

Experiments upon the evaporation, or rather transpiration of moisture from the leaves of trees, show that a single tree will throw off an immense quantity of moisture in the course of a season.

Williams, in his history of Vermont, has some interesting remarks upon this subject. According to his experiments the evaporation from a common sized maple, only eight inches and a half through, amounted to three hundred and thirty-nine thousand and seventy-two grains in twelve hours. A pint of water weighs one pound or seven thousand grains, and hence every acre of land which contained six hundred and forty such trees upon it, throws off three thousand eight hundred and seventy-five gallons of moisture in twelve hours. (See Williams' History of Vermont, Vol. 1, page 90.)

Taking this for granted, one may easily conjecture what must be the natural consequence when so large a tract of country is covered so completely with apparatus for evaporation. Nor ought any one to be surprised to find the thermometer ranging

at a lower temperature than it would in the same country, if divested of wood and subjected to the common operations of cultivation.

There is undoubtedly another position in which we ought to look at this fact as connected with climate and productions.

The *electrical* state of the atmosphere must be very different in such a dense forest, from what it is in an open country, and how far this may influence the productions of the soil, in hastening or retarding their growth and maturity, or vary the results of agricultural operations, cannot, in the present state of the science, be determined. That electricity is a most powerful agent in the changes which climates undergo, as well as in the more daily variations of the weather, no one can doubt, though he may not be able to solve the mystery of its operations, or to fully comprehend all its connections with the daily occurrences in meteorology which are manifest to the most careless observers.

That electricity also, has a powerful influence upon soils, is also beyond a doubt; but by what laws, special or general, it acts, or how the various effects which may be attributed to it, are brought about, is yet almost wholly unknown to even the most scientific.

The Aroostook River is closed by ice generally about the middle of November, and opens about the 20th of April. This agrees very well with the time in which the Kennebec River closes in the fall and opens in the spring.

The following tables will show the comparative temperature of the country on the Aroostook, with other places where such records are kept.

It will be well to observe that thermometers in towns, are generally kept suspended on the side of a building, which shelters them materially, while ours was constantly moving from place to place—sometimes on the banks of the river—sometimes in a dense cedar swamp, and sometimes on elevated but shaded ground.

Day.	Sun rise.	Noon.	Sun set.	Remarks.
Sept. 24	52°	48°	46°	At Harvey's on St. John—fair, cloudy, rainy—wind W.
25	30	57	47	At River De Chute—fair.
26	31	55	56	Aroostook Falls—fair—wind N. W.
27	38	57	60	At island 6 miles from mouth of Aroostook—fair.
28	53	65	57	At Presquile—fair, cloudy—w. S. E.
29	42	65	58	Four miles above Presquile—fair, shower at night,
30	40	69	63	Beaver Brook—fair—wind S. W.
	7)286	7)416	7)387	
	40 6-7	59 3-7	55 2-7	Average temperature for Sept. 52°
Oct. 1	40	68	54	Little Machias—clear, pleas't—w.N.W.
2	32	75	63	" " " "
3	55	44	37	Portage between Little Machias and Eagle Lake—fair, rainy.
4	30	48	45	Do. (at noon in cedar swamp)—w. S.
5	47	54	52	Do. " " rainy—w. S.
6	34	58	56	Do. " " at night rainy.
7	40	44	42	Do. " " fair—w. N.W.
8	27	46	38	Do. " " " w. N.W.
9	26	46	36	At Eagle Lake—fair—wind N. W.
10	34	56	48	At foot of Middle L.—cloudy—w. E.
11	40		56	At 3d Lake—rainy—wind E.
12	42			Bakersville—cloudy, slight snow—wind N. W.
13	40		35	Do. rain with snow.

Day.	Sun rise.	Noon.	Sun set.	Remarks.
Oct. 14	36	40	42	Bakersville—fair—w. W.
15	32	42	43	Fish River--some rain—wind S. E.
16	40	48	42	At head of Middle lake—rainy most of the night.
17	32		43	Portage between Eagle lake and Little Machias.
18	28		42	Mouth of Little Machias—cloudy.
19	26	38	32	No. 10—fair.
20	32		34	do. snow storm.
21	30	39		do. snow and rain.
22	32	40	36	4 miles above Umquolqus—cloudy, some snow and rain.
23	28	34	36	Mooseluck—fair, cloudy.
24	31		38	1-2 mile above La Bombique—cloudy, some rain.
25	34		36	At Umquolqus—rain.
26	32			No. 10—cloudy, with rain.
27	32		36	do. fair.
28	36			do. cloudy.
29				No. 7—snow-storm.
30	22			No. 4—fair.
31	26			

Crops. The crops cultivated by the farmers of this country, are such as is generally found growing in other parts of the State.

Indian Corn. Very little Indian corn has been cultivated here. The seasons for several years past, have been unfavorable for this crop, even in parts of the State which have long been cleared and laid open to the influences of the sun. They have been particularly severe here, where the forest has hardly been encroached upon. Hence but little attention has been given to a crop so liable to be cut off by early autumnal frosts. Occasionally, however, a

crop has been obtained, equal in soundness and weight, to any grown in any other part of the State. Mr. Goss, who resides on an interval farm in No. 10, 5th Range, informed me that in one season since he had resided upon the river, he gathered a crop of this, which weighed sixty pounds per bushel, and which was perfectly ripe. At present, it is very uncertain whether it can be raised to advantage. It is possible, that when the forest shall have disappeared, and the climate ameliorated by its absence, the culture of Indian corn may become a pursuit of very considerable importance to the agriculturalists of that region, provided they should cultivate an early variety, inasmuch as much of the soil is well adapted to it.

WHEAT. The staple crop of the Aroostook farms is, and ever must be, wheat. For this the climate, and most of the soil, is exceedingly favorable. The variety of this grain mostly cultivated, is the spring wheat, though some experiments with winter wheat have been eminently successful. It is usually raised upon a "*burn.*" Formerly, many were in the habit of falling the trees in the spring, burning as soon as possible, and sowing the wheat immediately. This made it so late before the crop could ripen, that the frosts and even snows of winter sometimes overtook and destroyed it before it could be secured. Experience has taught them a better system of procedure. The best mode undoubtedly is, to fall the trees and "*limb*" them, (that is, cut off the limbs,) in June. In the course

of the summer or fall, put in the fire, then "*junk*" and "*pile*," and sow the seed early in the succeeding spring. This gives the wheat the advantage of an early start, and it ripens as early, or nearly so, as it does any where in Maine.

Some prefer to let the "*chopping*," or trees that are fell, lie until the next spring, before they burn them. When an early burn can be effected, no doubt this is a very good mode. There is then no danger of burning deeply into the soil, as is sometimes the case during a dry time in the summer or fall, and the wheat has the benefit of the stimulus of the recent ashes that are made.

On lands prepared as above, the average crop is twenty bushels per acre.

I have mentioned that some experiments with winter wheat have been successful, and the promise that these experiments give, that this variety will be as successful here as any where, is strong and encouraging. Mr. Goss, the person just mentioned, has for the last four years cultivated it with tolerable success. I examined his crop last season while growing, and also after it was harvested.—This was sown upon interval land, ploughed, and yielded after the rate of thirty bushels to the acre. He attributes his success to the fact, that the ground does not freeze deeply here during the winter. The snow falling early and remaining late, prevents the frost penetrating deeply, and also prevents any considerable heaving of the ground by alternate freezing and thawing in the spring, and the roots are not

therefore thrown out and killed as they otherwise would be did not the snow protect them. This variety of wheat has also been successfully cultivated in township No. 4, on the Aroostook Road, and on the St. John river, above the Madawaska settlement. Mr. Goss's crop was very fine ; the straw grew long and healthy, and the berry was very plump and bright. It is to be hoped that experiments in regard to the culture of the winter variety of this crop will be continued. Should it finally be found that it is safe to cultivate it, an additional source of profit and prosperity will be ascertained. A country that will afford both winter and spring wheat, must be singularly favored, and need not, under ordinary circumstances, fear want or famine.

I regret that I am not able to give more accurate statistical information upon this and the other crops; such as the exact amount of increase per bushel sown—exact amount of crop to the acre—expense per acre of cultivating, &c. The great want of exactness in their operations, of which farmers almost every where are guilty, prevails among the farmers here. Scarcely any one of them can tell the precise amount of ground cultivated, quantity of seed sown, or bushels harvested.

Their answers to questions upon the subject, amount to general estimates. The provisions in the late law granting a bounty on wheat and corn, and requiring the applicants to make oath to the amount of seed sown, acres cultivated and bushels

harvested, will remedy this trouble in regard to these crops, but as the wheat was not thrashed when I was there, I must refer you to such returns as may be made to the Legislature.

The appearance of the fields during the summer, and the good quality of the grain harvested in the fall, would convince the most faithless that this is naturally a great wheat country. I have been informed that Mr. Lewis cultivated, in No. 7, on the Aroostook road, 80 acres of wheat and gathered 1600 bushels. I cannot vouch for the truth of this, as I did not see Mr. Lewis, he not being at home at the time I was there. This, however, is but one instance of the many that can be cited of the success attending the cultivation of this golden crop.

In 1837, Fish and Wiggins raised in township No. 4, on the Aroostook road, 1250 bushels of wheat on 50 acres of burnt land, averaging as you will see, 25 bushels to the acre. One hundred and forty of this was winter wheat, which grew upon seven acres, averaging twenty bushels to the acre. In 1838, they raised in the same township 750 bushels. Mr. Lewis, who that year resided in the same township, raised 750 bushels.

In 1837, there were raised in this township 6000 bushels of first rate wheat, which made an average of nearly 300 bushels to a family. Wheat during that year was worth $1,75 per bushel. It will be remembered that the spring season of this year was very favorable for getting good burns, and the summer also favorable for the wheat crop. In 1838,

they raised but about 3000 bushels, owing to the extremely wet spring season which prevented their getting burns soon enough to enable them to sow sufficiently early.

While speaking of the crops of No. 4, I trust that it will not be an improper digression to say something more of this township in this place. To the eye of an agriculturalist it appears like a gem in the wilderness. Perhaps, however, the circumstances under which we first saw it, may have caused a more vivid "first impression" than might otherwise have been the case. Our party had entered the Aroostook country in another direction, and had been for a long time exploring the streams and the forest.

We took the unfinished part of the road at its junction with the Aroostook on our return, and had travelled, or rather *wallowed*, through thirty miles of mud and mire, during the two first days of November, and those uncomfortably stormy. As we arrived at the end of this part of the road, the sudden appearance of enclosed and cultivated fields, and of the well graded, and handsomely constructed State road, stretching most invitingly before us, afforded a cheering and gratifying contrast to the leafless forest, and the miry path behind.

The new and convenient barns and the enormous stacks of wheat which occasionally met the eye, gave evidence of thrift and comfort among the settlers, which some older parts of the State might envy. In looking, first at the forest on either side,

reaching, dense and unbroken, to the very verge of the distant horizon, and then to the recently cleared and enclosed fields, and the comfortable looking farm houses before us, I could not but feel a pride in the triumph of art over nature, and satisfaction in looking forward to the time, and that not very remote, when the whole region on either side, now a wilderness, would, by the same means, be converted into farms, and afford a home for thousands of contented and happy people. The first tree was cut in this settlement in 1834. In passing along, although there was considerable snow upon the ground and more still falling, we found many of the settlers with their boys busily engaged in *junking* and *piling*, and some were ploughing. Here was the secret cause of the change that had taken place in so short a time. *Industry* had levelled the forest and converted the lair of the wild beast into an abode of civilization. Industry had wrought the change, and that too unaided by a great amount of capital, for nearly every settler when he first entered his lot, was poor and possessed little else than good health and courage. Now, they have an abundance of subsistence—are blessed with the advantages of social life—have a school of about forty scholars, and are well supplied with missionaries of different denominations to lead them in their devotional duties according to the dictates of their consciences.

RYE. But very little rye is cultivated in this region. It is, however, a sure crop, and a profitable

one. It is made use of in many parts, especially in No. 4, for fattening hogs, combined with potatoes boiled. I saw a white variety at Mr. Fairbanks' mill, the flour of which is as white as that of Wheat. It is a spring grain, and yields as much as the darker kind.

OATS. This grain is pretty extensively and generally cultivated, and much use is made of it both as a fodder before being thrashed, and as a provender for the horses and oxen employed in the lumbering business. The common variety is mostly the kind cultivated. I saw some fields of the Siberian, or "*horse-mane*" oat, as they are sometimes called. The climate and the soil suit them well, and when properly cultivated, the crop seldom fails. Mr. Fairbanks and others stated that they seldom obtained less than fifty bushels to the acre on burnt land. The price for several winters past has been one dollar per bushel.

BARLEY. I saw but few fields of barley—those however, were very good. This grain has not hitherto been very generally cultivated. It is coming very gradually into use, however, and will eventually become an important crop to the farmers of this section. It is a crop that has not been held in so high estimation in any part of our State as its merits deserve, although it is now fast gaining favor. The introduction of hulling machines, will soon make it more of a favorite, and bring it into more general use. In a part of the country where Indian corn cannot be safely relied upon, perhaps there is

no other grain which can be cultivated to greater advantage for a substitute, than this.

PEAS. Peas grow well in this country, either when planted alone, or sown with oats. I found in different places some of the grey pea mixed with the common kind. The seed of this variety came from Madawaska. The pea and oat crop is not so generally attended to as it ought to be. As a feed for swine, it is of great use, second, as some think, only to Indian corn. I could obtain no certain data of the amount which has ever been raised here per acre.

BUCKWHEAT. The variety called Indian wheat in Kennebec, but more commonly in this region, "Rough Buckwheat," is very extensively cultivated, not only on the Aroostook, but also on the St, John river. This grain, which is undoubtedly the true Tartarian Buckwheat, is said by some to be indigenous to this section of the State, growing wild in the woods, and furnishing food for the partridges and wild fowl. I was credibly informed that a Mr. Murphy, who was the first settler in the Tobique settlement, states that when he first went there, and while there was no clearing for many miles distant, he killed partridges that had this grain in their crops, and that he took it out and sowed it, thereby obtaining seed for future use. How this may be, I am not able to say. We saw none growing wild during our excursion.

In regard to this grain, there is no doubt that its growth, its great powers of yielding, as well as its

uses in domestic economy, have been much overrated. It has been confidently stated by many of its advocates, that it would grow best and yield most on poor land. This is a mistake. It likes a warm sandy loam, but it also likes to have this loam in good tilth and of good quality. On such a soil, it will sometimes yield fifty bushels from one of sowing. Some farmers on the St. John river cultivate it largely. A Mr. Raymond, of Wakefield, N. B., *I am told,* raised last season nearly 1500 bushels. A gentleman of Frederickton (Mr. Woodford,) informed me that he sowed, about the middle of June last, one peck and a half on one acre of strong but rocky land, which yielded him twenty-four bushels, the whole cost of which, when ready to be sent to mill, was six dollars, making the cost per bushel 25 cents.

It is much used for fattening swine and poultry, and for provender for horses and oxen. Many like it for bread, but it is not so palatable to others as the old variety. Care should be used in grinding it. If it be ground fine, so as to crush the hull, the flour will have a bitterness of taste. To avoid this, it will be necessary to set the stones so far apart as to just open the hull, and let it escape without being crushed at all. The flour falls out and the hull passes from the bolt, merely opened, but destitute of flour. It yields, when ground fine, about thirty-five pounds of flour to the bushel, but it is much better to so grind it that only twenty-five pounds shall be obtained per bushel.

In this country it seems to take the place of Indian corn, and often brings a dollar per bushel.

It grows about two feet high, has a minute yellowish green flour, and a rough triangular shaped seed. This seed shatters out very easily, and requires the utmost care in harvesting it, lest you leave it on the ground. The usual mode of management is to mow it when about half of the seed has turned black; then rake it up into small bunches and let them lie for some time to ripen, as it is said the rains do not injure it. When gathered, rugs and cloths are laid in the bottom and hung on the sides of the cart to catch what may fall out.

There is one objection to cultivating this crop, viz: it shells out so easily that it invariably leaves more or less of its seed in the ground, which thus becomes filled with it, and, going upon the principle that a weed is a "*plant out of place,*" it then becomes a bonafide weed.

In a country, however, where but little Indian corn is cultivated, it is quite an acquisition to the farmer, who puts it to very many valuable uses.

Beans. This crop does well on the Aroostook. The early white is cultivated here somewhat—but little attention, however, is paid to this or any other variety. A few for domestic use are generally planted, but as a field crop, I know of no one that has ever cultivated them.

Roots.—Potatoes. Perhaps no part of New England is better suited to the cultivation of most of the culinary roots in use among us, than this.

The potatoes raised in this country, when planted in season, are equal in quantity and quality to any whatever. The climate and soil both seem particularly congenial to this root. Nothing is wanting but greater facilities for getting them to market, to make their culture one of the most profitable branches of agricultural operations that can be pursued here. The variety most approved, is called the Christie potatoe, from the circumstance of their having been introduced by a Mr. Christie, who resides there. They are known in other parts of the State by the name of the St. John potatoe. No particular pains are taken here for this crop, or anxiety manifested to obtain a large amount per acre. Hence the actual power of the soil in this respect has never been fairly tested. Many assert that they have obtained three hundred bushels per acre, with common management. Mr Fitzherbert, near the mouth of the river, once obtained four hundred bushels on something less than an acre, but the soil was good, and he gave it a good dressing with common barnyard manure.

I am sorry to say, however, that easily as this root may be raised, from neglect in attending to its culture, a severe scarcity is not unfrequently felt, and from that circumstance they have been sold for from eighty cents to a dollar per bushel.

Ruta Baga. This vegetable can be raised here in great perfection. It is however not generally cultivated, not so generally as it should be, considering its value as an article of food for cattle

and swine during the winter season. No definite information was obtained as to the amount of yield per acre, but from the appearance of some few fields which I examined while growing, I could see no reason why the farmers of this region may not outstrip their brethren in other parts of the State in the culture of this root; and it is to be hoped that they will not long neglect so valuable an article of produce. Nothing can be more grateful to cattle during the cold season, when but little, save dry forage, can be had to sustain them. In 1837, Fish and Wiggin raised in No. 4, 1300 bushels of this root among the potatoes that were planted upon a burn. The quantity of land is not known. They obtained from the same land 800 bushels of potatoes.

Beets, Carrots, Parsnips, Onions, &c., all flourish well here, and can be raised with perfect ease and success. The *Sugar Beet* has never been tried, or if cultivated at all, no experiment has been instituted to ascertain the quantity which can be obtained per acre, nor whether it will be more or less saccharine than when raised farther south. There is an opinion abroad, among some, that when this root is grown in warm regions the saccharine matter is greater in proportion to the quantity of root, than when it is grown north. Whether any experiments have actually demonstrated this to be the fact in this country, I am not able to say.

The nature of the soil may have an influence upon the quality of this root, but reasoning from

analogy it would seem that it is more fitted for a cool than a sultry climate. The root seems to be a store house or magazine in which nutriment is to be preserved during the winter season for the future use of the plant—it being a biennial, requiring two years in which to grow and perfect its seed. The cooler regions of the temperate zone, as a general rule, produce those kinds of roots in much greater perfection as it regards size and quantity than the warmer portions. It is also a pretty well established fact, that the northern limit, at which any plant will flourish and fully ripen, will afford that plant and its fruit in greater perfection, than at the southern limit. The Sugar Beet is destined to become to the North, what the Sugar Cane is to the South, and I can see no good reason whatever, why the farmers in the Aroostook section of our State may not find it a safe and valuable business to embark in its culture and in the manufacture of sugar from it. The Sugar Maple it is true flourishes here in perfection, and affords a rich supply of sugar to those inhabitants who see fit to attend to the manufacture. Yet it is believed by those who have had experience in the culture of the beet and in the manufacture of Maple Sugar, that the former will afford a more ample source of sugar than the latter, in consequence of its requiring less labor, all things considered.

The improvements which have been made and are still making in the process of manufacturing Beet Sugar, will soon render this business as simple

and as easy as any culinary operation now performed on the common hearth. The distance of this section from navigation and the expense arising from the transportation of foreign molasses and sugar, make it an object of no small importance to enquire into the subject, and to adopt early measures to introduce the culture of this beet and the manufacture of sugar among them. It will be seen that I have been speaking of what *may* be done, rather than what *is* done; but as the common beet grows well there, and as the Sugar Beet will flourish where the common beet will, and as wherever the Sugar Beet will grow, sugar may be profitably made, there is nothing to prevent successful operations being carried on there. A country that can produce the Rock Maple and the Sugar Beet in perfection, need not depend upon the South for sugar or molasses.

FLAX. This plant grows here remarkably well, better perhaps than farther South. Its culture however is not carried on in any systematic manner, nor has there been to my knowledge any experiments made in regard to the best mode of culture in this region, or its management after being gathered.

Generally, a small patch is sown for the purpose of affording thread, &c. for domestic purposes, and not for an article for the market. No new or definite information, in regard to its relative value to them as a field crop, can be given. Should the recent improvements in the mode of dressing this

article, now being adopted in the Middle States, become more generally known and practised, it may yet be one of very considerable importance to this part of our State.

FRUITS. The settlement of this country has been so recent, that it cannot yet be ascertained whether it is or is not well adapted to the growth or the maturing of apples, pears, &c. Some apple trees have been set out in township No. 4, on the Aroostook road, which look well, and which bid fair to produce fruit at the proper time. From what information I have been able to obtain from old people in this State, I have inferred that it is necessary for the forest to have been cleared from the ground some time, before apple trees will flourish very well. It was thought in the early settlement of Kennebec County, and in many other places in Maine, that apple trees would never flourish well in it, as the first attempts were not very successful; but time has proved the fallacy of this idea. It may be well to be somewhat cautious as to what situation the farmer on the Aroostook should set his trees. A southerly slope would probably be the best until the country should become more open, and the rays of the sun have more chance for operation. The apple tree grows well in Houlton. It flourishes also in some parts of Canada, and very probably will ultimately do well in this section. The wild prune, the currant, the gooseberry, the cranberry, common cranberry, blue berry, wild

cherry, &c. abound and come to maturity in their proper season.

Grass. The different species of grass which are cultivated in New England, flourish here in great perfection. I have never seen better crops of herds-grass, clover, &c., than what I found in this country, nor was better hay ever put into a barn, than that which I found in that of Mr. Fairbanks, last autumn.

The natural grasses, such as blue joint, &c. spring up with great luxuriance and yield in profusion. Although they start somewhat late, there is generally no check to them in their growth, and they come forward with astonishing rapidity. On the 12th of June, on a small interval at the mouth of the Umquolqus, the blue joint was two and a half feet in height. Nature has undoubtedly designed this region for a grazing as well as an arable country. It is true that the winters are longer than in some other parts of New England, but this, which by some is considered a disadvantage, is met and in a good degree counteracted by the abundance of grass for pasturage and fodder. Considering the low price of land and the extensive range which cattle may have—the call, which for a long series of years must be made for good oxen, horses and beef to carry on the farming and lumbering operations of the country, grass growing and grazing cannot but be a lucrative business. If the farmer does not wish to keep stock, his hay will be in demand at a

fair price, sufficient to make it an object to enter into the business extensively. Grass sown upon a burn requires two years at least to get thoroughly set. It then affords a better fodder than when recently sown. The average amount of yield is one and a quarter ton per acre, and the average price is $12 per ton for loose hay, and $14 per ton for screwed or pressed.

AGRICULTURAL IMPLEMENTS. In a country where all are pioneers, and where comparatively few have any great amount of capital to begin with, it cannot be expected that agricultural improvements would receive much attention, especially when the apathy in regard to these things in the older and more wealthy parts of the State, does not offer any very powerful example to stimulate the back woodsman beyond the necessary operations of subduing the forest and merely raising his bread. Very little ploughing is as yet done, as most of the crops are raised on a "*burn*;" and as roads are not yet laid out and constructed, no other vehicle except the common sled is much used by the farmers on the river. I found here the threshing floor and fan of olden time. The thrashing floor is merely a sufficient number of logs, which, when hewed square and placed side by side, will make a platform eight or ten feet wide, having sides raised two or three feet in height on which the grain is laid and thrashed by the common flail. The fan is formed by semicircle of light board, say three feet in diameter, having a rim around the

circumference of thin wood and a handle on each side to manage it. In this fan the grain is taken up and shaken about, tossing it up occasionally, to catch the air to blow off the chaff. It is also waved back and forth over the grain as it lies in the heap, and the chaff thus blown away.

I found a very good thrashing machine at Mr. Fairbanks', made by himself, and propelled by water. It was made in the usual form of the spike or *scutching* machine. A cylinder of wood in which were placed teeth made of round bolt iron. A part of the teeth of the bedding were made of wood, which I am informed answered very well indeed.

In No. 4, I found Pitts' Horse Power and Thrasher in active operation. The large quantities of grain raised in this place make such machines very desirable and diminish the labor of getting it out very much indeed.

ROADS. A liberal policy in constructing good roads through the Public Domain, is undoubtedly the best policy to be pursued. It at once opens the country as it were to the inspection of the world, and induces many to enter and settle, who would not otherwise leave the older settled parts of the State. It is important however, that these roads should be laid out in the most judicious manner, so as to connect the most important points of the country, and at the same time throw open as large a quantity of settling land to the emigrant as possible. Indeed it would seem advisable to conduct

the roads through the best settling land, even at the risk of being more circuitous and incurring more expense. The Aroostook road, as laid out to the river, appears to have been very happily located in this respect. But from the Aroostook to the Madawaska settlement it appears, from what observations I could make, to pass through a tract of country less abounding in good settling land than if it were laid out farther west or east of its present location. There are two courses on the west side of its present position which it would be well to examine thoroughly. First up the Great Machias and west of the Upper Eagle lake, thence bearing easterly till it strikes Fish river terminating at the junction of this river with the St. John—or second, up the east side of the Little Machias and the Upper Eagle lake, and crossing the stream which connects the Upper lake with the one immediately below, and thence running down on the westerly side of Fish river, as before mentioned. Another avenue which it would be desirable for the State to open, would be from the town of Houlton to the mouth of Presquile, and thence to Madawaska settlement. A road from near the mouth of the Masardis or St. Croix to the Grand Falls of the Aroostook, would give as many thoroughfares through this territory perhaps as the State ought to construct. The various connecting roads should be made by settlers or proprietors.

The late Surveyor General, Dr. Whipple, very politely furnished me with a plan of a road running

from the St. Croix, by Pollard's Mills, to the mouth of the Aroostook. It passes diagonally through the townships belonging to Maine, which course, in case Massachusetts should decline her assistance, it would be well to adopt, as it is as short a route as could probably be selected. If, however, Massachusetts would cooperate with her usual liberality and energy, it would undoubtedly be best to follow the course of the river, as for a number of years such a route would accommodate the greatest number of settlers, and always be a road of much travel.*

GEOLOGY. Though I was required to examine the Geology of the country through which I passed; yet, as it has been so recently examined by our indefatigable State Geologist, who has reported thereon, it would be a work of supererogation for me to report upon the same subject; especially as a narration of the facts would be merely a recapitulation of his observations. I shall therefore merely bear testimony to the able and faithful manner in which he has performed this part of his task. Some recent discoveries of fetid limestone have been made in No. 11 5th Range, since his visit to that country, owing to clearing and burning, which laid bare the rocks and which were before hidden. Slate, limestone, and graywacke are the principal rock formations at present visible. No granite formations were seen by our party on the Aroostook or its tributaries. The characteristics of the rock formations, as Dr.

* The plan is deposited with the Board of Internal Improvements.

Jackson observes, indicate coal or anthracite, but it is very possible that this region is the extreme western limit of the coal formation which occurs in the Provinces east of this. It may be here observed that any country which has a good soil, plenty of lime, iron and coal, is emphatically a rich country. All of these requisites, except the last, are abundant on the Aroostook, and the place of the last will be for many years supplied by the immense forest which covers the country.

State Farm. I avail myself of the suggestion of a friend to recommend the establishment of a State Farm in this region. There are many reasons why such an institution would be of great utility to this section of the country, and highly beneficial to the State at large. Lands of any quality and in any quantity can be selected. Lumber for buildings and fixtures is at hand, already belonging to the State.

The object of it should be to introduce the various breeds of cattle, sheep, hogs and other stock; to cultivate the various crops which it is desired to acclimate, and the properties of which it is wished to test in this latitude; to introduce the various fruits which would probably grow, and thus form a source whence the settler could look for a supply to commence his operations or to renovate his stock and crops when degenerated or exhausted. I am aware that this may be considered visionary to many, nor do I know that any thing of the kind has as yet been commenced in any of the States, but in Europe,

National farms are not uncommon, and the citizens of this Republic are not unfrequently benefited by importations from them.

The Merino Sheep from the National or King's flock in Spain, and from the National farm at Rambouillet in France; the Saxony from the Electoral flocks in Germany, by which our own country has become a rival in wool growing with many of the kingdoms of the old world, may be mentioned as instances of the great and extended good which has arisen from similar establishments abroad. There is one advantage to be considered in locating a farm in this part of our domain. It is the most northern section of our State, and we might be pretty well assured, that whatever came to maturity here, would also mature in any other part of New England.

The expense of commencing need not be great, as the object is utility rather than splendor; plain practical excellence rather than useless show. It is believed that under the management of a man of good sense and practical skill, such an establishment would soon pay its expenses and become a source of good stock and seeds, and a pattern worthy of imitation.

General remarks.—Resources. It will be natural to enquire what are the resources of this part of the State? I answer, they are obviously more than is found in many tracts embracing the same amount of territory. In the first place the *lumber* stands most prominent. At present it is

the best portion of Maine for lumber, although as it regards pine, there is not as many trees to be found upon an acre as in some other sections; yet what grows here, is of an excellent quality, and readily commands the highest price. The other varieties of lumber, such as cedar and hackmatac, are very abundant and have not yet been disturbed. *Second*—The large amount of good soil, which by proper attention will afford a surplus of produce for the use of less favored portions of the State. *Third*—Its mineral resources, especially lime, will be a source of profit and comfort to the residents as soon as enterprize shall take hold sufficiently strong to place it within the reach of the consumer. Indeed, I see no reason why, in the course of a few years, the inhabitants of the valley of the Aroostook may not send out, as a surplus over and above what they may need for home consumption, large amount of lumber of every description, wheat, oats, rye, barley, potatoes, beef, pork, wool, live stock, such as neat cattle, sheep, and horses, in abundance. There is no natural obstacle in the way to prevent this being done.

Objections to the country. It will be also natural to ask what are the objections to settleing in this country? That there objections in the minds of almost every one who has been brought up in an old settled country, where all the comforts of civilized life abound, I am aware; but these objections are of a nature which time, industry and perseverance will do away. The emigrant who

goes into the forest to prepare or make a farm for himself, must reflect before he leaves the pleasant abodes and cultivated fields where he has been wont to enjoy the accumulated convenience of years of toil and labor, that he must of necessity leave these behind, and take the world in the "*rough*" as it were. He must remember, that he goes there, not to find the pleasures or the refinement of the town or the city, but to create them for himself—to manufacture them, so to speak, from the *raw material*—to establish and build himself up from small and mayhap from humble beginning. The first troubles that will be sure to introduce themselves to the stranger are the *black flies* and *musquitoes* during the warm season. These however, are no more abundant here, than in every new place where the forest abounds. Every pioneer has had to encounter them, and they gradually disappear as the country becomes cleared and cultivated. The *lack of Mills* has heretofore been a serious objection, but, thanks to the liberality of the State, by the encouragement offered in the act of 1838, this will soon be obviated. *Early frost* may be considered as a serious objection by some. This however is one, which may also be considered as resting for the few last years upon all New England. It is true, that as a general rule, the frost is earlier here than in Massachusetts; but, with the exception of Indian corn, all the staple crops of our agriculture ripen perfectly well.

WANT OF SCHOOLS AND RELIGIOUS PRIVILEGES. All new countries are liable to this objection. It is one which, for the first few years, is almost inevitable; but it is nevertheless astonishing how soon the New Englanders make arrangements to meet these wants. Almost before they have procured the necessary buildings for their own protection, and ere the "*first burn*" has done smoking, the school mistress may be seen, with a bevy of urchins about her, listening to her instructions; and the missionary is made welcome to the settlement, and the utmost attention given while he leads in the devotional duties of the Sabbath.

The lack of intelligent and refined society operates as an objection in the minds of many. It is true, that the same amount of refinement cannot be found, and indeed cannot be expected, in a new country like this, where the wilderness stretches between the several settlements for many a league unbroken and undisturbed, save occasionally by the clearing made by some one who has had the courage to leave the busy haunts of men and wrestle in solitude as it were with nature herself; but on the other hand, if you do not find the refinements, you also do not find many of the follies which too often accompany those refinements, and make fashionable life ridiculous. As for intelligence, the yankee who goes into the wilderness or elsewhere, carries it with him, and the schools before mentioned are sure to perpetuate it.

Should you advise me to go to the Aroostook? is a question often put. Before answering this, I

would use the characteristic privilege of asking, who are you?

If you are already well situated—have a good farm—live in a pleasant neighbourhood, and are blessed with the common goods and chattels necessary for the well-being and happiness of your family, stay where you are—go neither east nor west. Are you a man of feeble health, with little capital, unable to undergo the severe toils of subduing the forest, and unable to hire? It would not be advisable for you to go there. Are you idle—lazy—shiftless and vicious? Go not thither. Better stay where,(if you cannot reform) alms houses and prisons are more abundant to administer to your necessities, or to ensure your safe keeping. Are you in straitened circumstances, but in good health, with a robust and hardy family of children to assist you? Go to the Aroostook. If possible, take a supply of provisions with you to last till you can get a crop—select a good lot of land, be prudent and industrious, and in three years you can look around upon your productive acres and your well filled garners with satisfaction. Are you a young man just starting in life, but with no capital, save a strong arm—good courage, and a *narrow axe?* Go to the Aroostook; attend assiduously and carefully to your business; select a lot suitable for your purpose, and with the common blessings of providence, you will, in a very few years, find yourself an independent freeholder, with a farm of your own subduing, and with a capital of your own creating.

NOTE.—[Page 37.]

(*a*) These remarks were written before the late troubles took place in regard to the trespassers on the Public Lands. Those, however, who have been stationed on Fish river, are undoubtedly aware of the trouble they would have had to get to that station, had they not gone in on the ice during the winter.

ERRATA. Page 21—9th line from bottom, for "puddingstone conglomerate," read *puddingstone (conglomerate.)*

Page 39—6th line from bottom, for "both branches," read *both banks*.

James E Mitts Cat

THIRD

ANNUAL REPORT

OF THE

GEOLOGY

OF THE

STATE OF MAINE.

BY

CHARLES T. JACKSON, M. D.,

Member of the Geological Soc. of France; of the Imperial Mineralogical Society, St. Petersburg; of the Boston Soc. Nat. Hist., and Cor. Memb. Acad. Nat. Sciences of Phila.; Lyceum Nat. Hist., N. Y.; Albany Inst.; Nat. Hist. Soc., Montreal; Prov. Frank. Soc.; Prov. Nat. Hist. Society; Amer. Acad. Arts and Sciences; Hon. Memb. Maine Inst. Nat. Sciences;

GEOLOGIST TO THE STATE OF MAINE.

AUGUSTA:

SMITH & ROBINSON, PRINTERS TO THE STATE.

1839.

STATE OF MAINE.

RESOLVE AUTHORIZING THE CONTINUATION OF THE GEOLOGICAL SURVEY OF THE STATE.

RESOLVED, That the Governor with the advice and consent of Council is hereby authorized to employ some suitable person or persons, to continue the Geological Survey of the State at a salary not exceeding Fifteen Hundred Dollars per annum.

RESOLVED, That the sum appropriated for this purpose shall be subject to the discretion of the Governor and Council, and be expended in continuing said Survey.

RESOLVED, That it shall be the duty of the Governor and Council to lay before the Legislature at its next annual session a detailed account of the progress of the survey together with the expenditures in prosecuting the same.

STATE OF MAINE.

IN COUNCIL, April 21, 1838.

CHARLES T. JACKSON, M. D., of Boston, Mass., was by the Governor, with the advice and consent of Council, appointed Geologist, and SAMUEL L. STEPHENSON, of Portland, Assistant, to continue the Geological Survey of the State, agreeably to the provisions of "Resolves authorizing the continuation of the Geological survey of the State," passed March 23, 1838.

Attest: SAM'L P. BENSON, Secretary of State.

STATE OF MAINE.

IN COUNCIL, April 26, 1838.

ARIEL WALL, of Hallowell, in the County of Kennebec, was by the Governor, with the advice and consent of the Council, appointed Additional Assistant to attend Dr. Charles T. Jackson, in the Geological Survey of the State, and to procure a horse and covered waggon for the purpose of conveyance, under Report of Council accepted on the 25th instant.

Attest: SAM'L P. BENSON, Secretary of State.

To the Senate and
House of Representatives:

"The Third Annual Report on the Geology of Maine," by Doct. Charles T. Jackson, having been laid before the Governor and Council, the same is herewith transmitted to the two branches of the Legislature, with the letter of Doct. Jackson, accompanying said Report.

JOHN FAIRFIELD.

COUNCIL CHAMBER,
February 13, 1839.

INTRODUCTION.

"Geology is now so generally cultivated by all civilized people, that the degree of attention paid to it, is almost a sure criterion of national intelligence and prosperity." If this is the case, it must be that this science reveals something important to mankind, and no man need long remain in doubt as to the nature of the facts and principles which are its subjects. For Geology unfolds the structure and composition of our globe, and reveals to us the efficient causes that have been in operation during the successive epochs of creation. It delves into the recesses of the earth, and brings forth its hidden treasures, and by its light, the situations in which are found various useful mineral substances, are fully exposed. Certain rocks abound in metaliferous veins and beds, others contain combustibles, and the latter are never found in conjunction with the former. Limestones, of various ages, possessing peculiar properties, are discovered, and their composition is learned by chemical analysis, by which we know how they will work in the arts. Some are found suitable for making lime for cement, or for agriculture ; others are incapable of making lime that will slake, but furnish a valuable hydraulic cement. One class of limestones is remarkable for the veins of lead and silver ores it contains—another never contains any metallic ores, excepting iron. Coal is never found in that group of rocks called primary, nor in any of the older stratified rocks ; hence our attention is turned away from researches in such strata for coal mines, and directed to those groups of strata in which they may occur. Iron ores belong to several distinct species of rocks, and there are also alluvial deposits of bog iron ore. In the ancient rock formations, are found the magnetic and specular iron, while the calcif erous slate rocks more frequently contain the compact red oxide

or hæmatitic iron ores. Certain varieties of pyritiferous slate are valuable for the purpose of making alum—others, containing magnesia, are unsuitable for that purpose. Serpentine rocks are valuable, both for marble and for the manufacture of Epsom salts and carbonate of magnesia. Certain varieties of limestone are more valuable for marble, than for making lime ; and some kinds of limestone are found to make a good lime for cement, while they do not furnish so good an article for agriculture. Building stones are liable to be contaminated by the presence of pyrites and protoxide of iron, both which substances greatly injure the quality of the stone, and not only produce unsightly stains, but also cause it to decompose and crumble into a brown powder, and thus impair the strength of the material. Some kinds of building stones are liable to the infiltration of water, and crumble readily in our cold climate by the action of frost, while they might answer for permanent architecture in milder climes.

Agriculture draws most largely on the science of Geology, for the elucidation of the origin, distribution and composition of soils; and the amendments required being determined, we have to ascertain whether the required materials occur in the vicinity where they are wanted. For it would be of no use to the farmer, to inform him that the substances required, occurred a hundred miles off, for the large quantity of matter required, would forbid the expense of distant transportation.

A Geological Survey embraces all the above mentioned topics; and the actual state of the country, with its available resources, are only to be developed by such researches. Idle and fraudulent speculations, originating from self delusion and imposture, are thoroughly checked, and erroneous opinions concerning minerals, supposed by those ignorant of science to be very valuable, are corrected, and vast sums of time and money have thus been actually saved to the State every year during our labors. A handful of iron ore is no longer liable to be mistaken for an inexhaustible and valuable mine, nor are the people anxious to set up costly furnaces to work such trifling deposits, but those

which are really valuable are fully explored and described, and the exact quantity that may be depended upon for the supply of the furnaces, is known. No longer are hand specimens of granite received as inexhaustible quarries of building stone, or polished masses of greenstone trap sold for marble, but the situation, extent and value, of every available quarry, is described, and the quality of the rock tested.

The slate quarries of Maine are capable of producing many millions of dollars revenue to the State, and the public is now learning from the Geological Reports, their situation, extent and value. Liberal encouragement should be given to individuals or companies, who may invest their labor or capital in this productive industry, for the commerce of the State, by enlightened policy, may be quadrupled in a few years. A trifling bounty of fifty cents per ton on slates wrought from the quarries of Maine, and as much per ton on every ton of iron manufactured from raw materials found in this State, and ten cents per hundred square feet on glass made in Maine, would at once set all the wheels of industry in motion, and the resources of the country would no longer remain as they now are, idle and unproductive. Nothing is wanted so *much* in this State, as stimulus to enterprise, and a feeling of confidence in the protection of the Legislature.

The mere indication of a wish to encourage productive industry would do much towards its promotion, and slight special bounties are better than exemption from taxation, since the bounty depending upon the quantity of the manufactured article produced, would stimulate the exertions of manufacturers to produce more than they otherwise would; and there is no danger of over-stocking the market with such articles as I have mentioned, since they are in such universal demand, that all the supply would be readily taken up by purchasers. If we could but estimate the amount of money paid out by Maine for iron and glass alone, and should then learn how easily those articles might be wrought in Maine from her own soil, we should be astonished at the fact, that there is but one small blast furnace in the State, and not an ounce of glass is made

here, although the raw materials are abundant and every natural facility is afforded for its manufacture.

Slates may be obtained in Maine of better quality than those of Wales, and yet our houses continue to be covered with the foreign article. It may be seen by a simple calculation, that a most profitable and thriving business might be carried on in this department, and that the population of whole towns might be supported by the profits arising from the labor. In order, however, to effect this, a liberal policy must be adopted, for a large capital is required for such an investment, to render the work profitable. A rail road from Bangor to the Piscataquis, and from thence to the navigable waters of the Kennebec, would pass through some of the most fertile regions of the State, and would bring the Mineral, Agricultural and manufactured produce to market, and afford a ready communication with Bangor. Sueh a route is feasible and it will ultimately be constructed. Why not do it as soon as possible and avail yourselves of the advantages that are sure to arise from such a work?

The Geological Survey of Maine, if rightly improved, will become one of the most profitable investments ever made by the State, and will compare in utility with any similar work in any part of the world. The natural resources of the country will be fully unfolded, and Maine will hold a conspicuous rank among her sister States. Possessing a most extensive sea-coast, indented with numerous good harbors, while the country is intersected by a great number of large rivers and streams, capable of furnishing adequate water power for any machinery, blessed with an abundant supply of the most useful minerals and rocks, valuable in the arts, and with a soil, in many districts, unusually productive, she ought to rank high in the manufacturing arts. It is, however, unfortunately the case, that too many of her enterprising citizens are engaged in the more precarious and less useful business of the lumber trade, and I am of opinion that a detachment from that business could be advantageously employed in works of more permanent utility. Whoever looks into the productive industry of Massa-

chusetts, New-Hampshire, Vermont, or Connecticut, will find that the greatest amount of value is from manufacturing establishments, and from agricultural business ; and let them apply their estimates to the probable capacity of Maine, and see how great and favorable a change may be effected in the business of the community. Mineral wealth is too frequently under-valued, unless it be the working of mines for the precious metals, the most unproductive of all mineral substances.

Whoever examines the structure, composition and order of superposition of rocks forming the visible crust of the globe, *will discover* that there are great and distinct natural groups, which may be studied in a perfectly systematic manner, independent of all theoretical considerations. Such is the nature of positive geology, which forms the leading features of a Geological Survey. Thus we have described all the rocks exactly as we saw them, and the annual reports must be regarded as the mere field notes that may serve for a more thoroughly rational system, illuminated by a comparison of the results with each other, and with the great rock formations of foreign countries, with the application of economical considerations which may result from a more complete knowledge of the resources of the State.

Thus in my final Report, I propose to bring all our observations to general results, applying the laws of induction or of analysis, as the case may require. Statistical views sought out in the workshops, furnaces, and chemical laboratories, comparisons of natural resources of the various parts of our country, now actually engaged in geological surveys, are subjects of immense importance, and are now placed almost within our reach by the liberal policy of the different States where such surveys have been ordered, and are now in successful progress, under the superintendance of many learned Geologists. The geological maps of the various States, when put together, will form a stupendous monument of scientific labor, honorable alike to the surveyors, and to the whole country where they have been supported in their researches. On such Geological maps, the boundaries of all the

great rock formations are to be portrayed, and sectional views or profiles, shewing the order of superposition of strata, their dip, direction, and relative age. Such plans, however, are never drawn up as final results, until the completion of a survey, and they will then constitute the most important documents, and serve as the keys to the resources of the States. I trust that the map of Maine will not be allowed to remain blank in the geological map of the Union.

Rocks are divided into two grand natural groups, the stratified and the unstratified, or those which are in thin sheets or layers, and those that are not so formed, but are aggregates of mineral substances mingled together, as if they were shot out or segregated during the cooling of a molten mass. Those rocks which exist in strata, all Geologists agree in considering as sedimentary deposits from water, and the strata were gradually deposited in regular layers in a horizontal manner. Since their deposition, they have been lifted up so as to incline at various angles from the original horizontal line, and the lower layers of the strata have undergone chemical changes or metamorphosis, evincing the effects of intense heat.

Whoever studies the unstratified rocks, and compares them with modern volcanic productions, and notes the analagous effects produced at their lines of junction with stratified rocks, will soon discover the reasons why all geological writers describe them as resulting from igneous fusion and protrusion from below. Maine presents admirable instances illustrative of the foregoing observations, and even her granitic mountains have a strong family likeness to volcanoes.

The more ancient fissures through which molten rocks were thrown up, have a north and south direction, or the line is more frequently to the west of north and east of south, while those of more recent origin, verge more and more to the east and west direction, and this result, obtained by an immense number of observations, has already been fully substantiated in my former

Reports, where the relative ages of these important land marks for the Geologist, are fully recorded.

It would be improper for me yet to generalize the whole mass of facts relating to the ages of the rocks of Maine, or to draw up a full description of their boundaries, for but two thirds of our map is colored with the outlines of the great rock formations, and there may be other data yet required to be entered into the evidence which is to form the basis of our general theories.

Enough already has been recorded to give us a proximate view of the results anticipated as forthcoming, and the economical results are more fully reported than mere theoretical considerations. The work is however still imperfect, and must be so until the results are brought together in a single point of view.

Primary rocks. The primary or primitive formation, is so called from the opinion long since entertained, that the rocks of that series were the first created, and preceded the existence of organized beings. This is highly probable, but no one now supposes that the granite mountains were *thrown up* anterior to the deposition of strata, which are filled with myriads of shell fish and moluscous animals, and marine plants. Nor do I think that there is any reason to believe that all the upheavings took place at the same epoch. The Swiss Alps were evidently thrown up posterior to the deposition of the fossiliferous jura limestone, and in some places in Germany, it is evident that granite rocks were elevated since the deposition of chalk, the newest deposit of the secondary formation. In Maine, however, the epoch of elevation of her granite mountains, appears to have been vastly more remote, and took place immediately after the deposition of the older transition slate rocks. Their time worn escarpments bear testimony to the same fact, and if the country was raised above the sea anterior to certain members of the upper secondary formations, then they would naturally be found wanting. We therefore find but limited patches of secondary limestone, and new red sand stone, all of which were deposited subsequent to the eruption of the granite mountains.

The GNEISS, or stratified granite, is merely a metamorphic variety of the mica slate, more charged with felspar, from its contiguity to the granite.

MICA SLATE is a stratified rock having plates of mica alternating with grains of quartz in parallel layers, more or less contorted, according to the movements to which it was subjected while still plastic from heat. The only matter of supposed organic origin contained in it, is plumbago or graphite, which is nearly pure carbon, and may have originated from vegetable matter altered by heat. It abounds in Maine, and is highly valued for flagging stones.

TALCOSE SLATE is like the mica slate, but contains *talc* instead of mica, and is of course a magnesian rock. It is very abundant in Maine.

ARGILLACEOUS SLATE is found passing by imperceptible shades into micaceous and talcose slate, and is sometimes so highly charged with silex, as to become properly a blue quartz rock. It is also frequently impregnated so strongly with pyrites or bi-sulphuret of iron, as to form a pyritiferous slate, which is advantageously converted into copperas and alum.

TRANSITION ROCKS. This great formation is well characterized, and abounds in Maine, forming huge bands of parallel strata, broken open by protruded rocks. Various slates, lime stones, fine grauwacke and coarse conglomerate with shells, belong to this group. The characteristic fossils are those strange crustaceans of the trilobite family, and numerous species of terebratulæ and spiriferæ.

Some of the most abundant fossiliferous strata may be seen on the borders of Cobiscook bay, and also on that great belt of grauwacke that extends from the banks of the Aroostook to the Canada road west of Moose Head Lake.

Specimens of the latter rock, with its fossil shells, have been so liberally distributed by a diluvial current, that they may be found almost every where between the Kennebec and Penobscot rivers, laying loose in the soil, where they were deposited by the ancient current from the north.

Huge boulders of the conglomerate belonging to the same formation, also abound, and were driven southwardly from the group of conical peaks, Mars Hill and Sugar Loaf Mountain, on the Seboois river.

Secondary rocks are characterized by their resting upon the transition and by their fossil contents and mineral composition.

Certain groups of limestone and sandstone are the only rocks of this series that occur in Maine, and they may be seen at Machias, on the sea coast at Starbord's creek, and on the shores of Perry, upon the St. Croix river.

Limestones of the same class also occur upon the Aroostook, Seboois and Tobique rivers, the latter river being however beyond the limits of Maine. In the secondary, and even as low as the grauwacke rock formations, we frequently find valuable beds of coal, the Bituminous kind being found in the secondary, and the Anthracite in the transition formations.

We are never to look for that combustible lower down in the series than the newer transition, nor above the secondary. Hence the absurdity of searching in granite and mica slate rocks, for beds of coal, and the mistakes arising from the occurrence of *lignite* in the tertiary clay—both common and fatal errors to those who engage in such absurd enterprises.

Tertiary formation. This is always found in Maine to be composed of two great beds of clay or clay marl, filled with marine shells of various recent and extinct species. It never was much elevated after its deposition, and now is rarely found more than 150 feet above the present sea level. Nearly all the valleys lower than this point are filled with marine deposits and abound with marine shells. I have collected a numerous series of the different fossils of this deposit, and shall present drawings of them in my final Report.

Diluvial deposit. This formation I have already discussed in the former and in the present report, and it is only necessary to add, that there are abundant proofs of such a cataclysm in [illegible]

part of Maine. It is evident that the current of waters came from the North and rushed towards the South, sweeping with it all loose materials in its way, and depositing them far from their parent beds.

The reader is invited to note the great number of curious facts we have collected on this subject, and to mark them as he journeys through the State.

The record is so legibly written that "he who runs may read."

REPORT.

His Excellency John Fairfield,
Governor of Maine:

Sir:—I have the honor herewith to lay before you my Third Annual Report on the Geological Survey of Maine, containing an account of the Geological and Agricultural researches which I have made during the past season, in the regular progress of the work which it was my duty to perform. The amount of valuable information contained in its several departments, I shall leave for the Government to judge.

In a survey of this character, it cannot be expected that Annual Reports of its progress should assume that systematic form which belongs to a full and complete Report. The facts collected are different parts of the frame work, which will form a complete edifice, when duly arranged and put together; but such a construction can be made only when *all* the parts are duly prepared.

In order to render subsequent operations more easy, and the work more comprehensible, the data are arranged, so far as practicable, in a systematic form which necessarily follows the regular order in which they have been collected, and must vary more or less as I am called off from my regular sectional lines.

It has been my earnest desire while engaged in the survey, besides keeping up a regular and scientific system of operations, to render it of immediate practical utility; and thus it occasionally becomes necessary for me to leave for a time those researches which were necessary to fix the order of superposition of the rocks, for the sake of exploring the situation, extent and value of certain rocks or minerals

valuable to the farmer or manufacturer. Hence it will be discovered that our attention is occasionally called off from sectional measurements, and devoted to the running out of some beds of limestone, and the exploration of the extent of deposits of iron ore, substances of immense value to the State, and calculated to render the agricultural and manufacturing interests of the country of much greater importance. It has been our good fortune to discover, by geological and chemical researches, immense and incalculable quantities of limestone suitable for agricultural and other ordinary uses. Some of the limestones being nearly pure, and others slightly colored by foreign matters. All of them have been analyzed in my laboratory, and their exact value will be found recorded in the present Report.

Besides making chemical analyses of the limestone, I have actually burned nearly every variety which we have described, and ascertained how they will behave in the fire, the color, power of slacking, strength of the mortar, and all other practical operations for which they are required, so that I am able to speak positively as to the precise qualities of the lime, and to direct the lime-burner in his operations.

The citizens of Maine, wherever we have been, will fully appreciate the value of such researches, and will rejoice in the fact that by our labors immense resources are opened to the enterprising agriculturist. Where the great expense of transportation from the sea coast forbade the free use of lime, great and inexhaustible beds of excellent limestone have been discovered; and where lime cost from two to four dollars per cask, we have shown that it can be made for from twenty-five to fifty cents! Hence a vast amount of labor, time and money is saved to the farmer, while he holds in his possession the means of enriching his soil, by which his agricultural produce may be increased from fifty to an hundred per cent., as has been done by similar means in other countries, and in some parts of our own. And it is evident that if the farmer can raise his bread cheaper, he can afford to sell it lower also, and hence every citizen of the State will receive his share of the benefit resulting.

While the farmer, enabled to obtain larger crops from a given area of land, is in a measure relieved of his burthen, and instead of being obliged to labor incessantly in the gleaning of immense tracts of soil, he has time to render his farm neat and elegant, or finds time for intellectual improvement by study.

By the chemical analysis of soils, we are enabled to point out to the farmer their capabilities, and the improvements which are to be made in their cultivation. General rules derived from foreign experience have so often failed in producing the promised results, that the farmer is justly suspicious of such directions, and decries farming by books, declaring that he has tried certain experiments which proved total failures, and that he has no faith in them.

The root of the difficulty lies in the fact that an experiment may prove successful on one soil, and a total failure on another of different composition and under a different latitude. And the only way to overcome this difficulty, is to make chemical examinations of the soils in question, and then only can we know what it is proper to place upon them as amendments, aliments, or stimuli.

The enormous amount of labor required in the analysis of *soils*, precludes the busy farmer from attempting the task, allowing that he possessed the requisite instruments and skill. Hence we are enabled to render him a most acceptable service.

The present Report contains an account of the analysis of soils, some of which are very minute, while in all the essential or peculiar principles are most accurately ascertained. It is evident, that alone, with the most indefatigable exertions, I could not, during the space of three months, have performed so much chemical labor, and I beg leave to state that I have been most efficiently aided in the work by my worthy pupil, Master John Chandler, Jr. of Augusta, who has during the whole winter assisted me and performed under my immediate direction, a large number of the proximate analyses. While in the field, Master Chandler was allowed his expenses, by permission of the Governor, but for the labora-

tory work he receives no compensation. Provision ought to be made for an assistant in the chemical department, since so vast an amount of labor is there to be performed.

Besides the analysis of soils, we have made chemical examinations of limestones and iron ores, the results of which are herewith communicated, and will show the actual respective value of each specimen in the collection, while the Report exhibits an account of the quantity that may be obtained. In each analysis great care was taken to select such as were fair average specimens, in order to present results that could be depended upon in actual working.

Among the important researches, may be ranked the discovery of an inexhaustible locality of Hydraulic limestone, suitable for sub-aqueous constructions, such as canal locks, dams, cisterns, drains, culverts, water proof cellars, &c. The discovery of the capacity of a rock for such uses, could only have been made in a chemical laboratory, where the power of the combinations is ascertained.

The discovery of the extent and value of certain deposits of iron ore, before neglected, for want of information as to their extent, has given an immense value to swamps and bogs before worthless.

Black oxide of manganese, a substance required in the manufacture of bleaching powder, I have discovered in immense beds at Dover, upon the Piscataquis river, and when factories are established in that vicinity they will be favored with an abundance of matter required for disengaging chlorine, and with lime for the combination producing the chloride of lime above mentioned.

At Dexter I also found an abundance of excellent limestone, and examined, chemically, the ore lately extracted from a small vein in the slate rocks, discovering by analysis that the ore in question is rich in silver, but as yet there have not been found veins of sufficient magnitude to warrant mining. It is proper under such circumstances to warn the people against wasting their money, where we can prove by calculation it would not prove a profitable investment, and to turn their attention to those things of real value.

By their limestone, more silver may be earned than could be excavated from much larger veins than those described, and hence the limestone was earnestly recommended for burning into lime, since the saving to the citizens of the town would be no less than two dollars per cask on every cask of lime used.

The saving of time, labor and expense in vain researches for the precious metals, and for coal, in districts where such substances never occur, would annually amount to more than the cost of the Geological Survey of the State; and the destruction of credit, following close upon the steps of idle or fraudulent speculations, is entirely arrested by the survey in which we are engaged.

Those who will look into the history and the operation of this system, will at once perceive that since the Geological survey began, speculations in mineral substances have been thoroughly checked; a triumphant fact to disprove the opinions of those who feared that the survey would produce speculation. In fact it is clearly evident that where the whole community possess the same sources of information, that one man cannot practice upon the ignorance or credulity of another. Nor can any one want such information as is required to point out whether a substance is valuable or not, and if it exist in sufficient quantity, for I have always held myself ready to inform the *owners of the soil* as to the exact nature of the case, while I always refuse giving prior information, to those who are not owners of the soil, where substances of value occur. By such a system the truly valuable resources of the country become available, while public confidence is restored, knowing that what we state is strictly true, and that the State has instituted such a survey to obtain and diffuse correct information.

Such I know were the views of Governor Dunlap when he originally recommended the Geological Survey of the entire State, and those views have been most strictly carried out in our labors. How much the resources of Maine have risen in the estimation of her sister States, and in the view of the General Government, we cannot say; but those who have

an opportunity of knowing, declare that the result thus far has been most satisfactory.

I beg leave to call your attention to the Geological Cabinet, which is arranged in the State House, for the information of those who may feel a desire to know what mineral substances are found in Maine. That collection now numbers no less than 1,600 handsome specimens of rocks, minerals, and soils of the State, all arranged, labelled, numbered and described in a complete catalogue.

In addition to this collection, we have made ten others, for the colleges, academies and societies, provided for by law. The smaller institutions were provided with specimens of every mineral substance occurring in the State; but it was not thought needful to send specimens from every locality, since they are often identical as to their characters, and it is supposed that the academical collections are to be used for instruction of pupils.

The State Cabinet has become one of the most interesting objects to citizens, and strangers who visit Augusta, and presents at once the means of judging respecting the relative value of any important minerals of the State, and may become the means of settling questions concerning acts of incorporation for working mines and quarries, since the Committees may be at once referred to specimens in the Cabinet, by which they will perceive whether there is any well founded reason for the granting a charter. Considered as a source of rational amusement, the geological collection offers many curious specimens, showing the history of the world while preparing for the residence of man, as well as many others illustrating chemical and physical changes which began with creation's dawn.

Those collections furnished to colleges and academies, will serve to create a taste for the study of mineralogy and geology in various parts of the State, and who will venture to predict the results which may follow from the development of many acute intellects that may hereafter enter the field of science?

A Geological Survey of the Public Lands had been for-

merly recommended by the Land Agent, Dr. Rose; but the proposal was not supported by the Legislature, until a Geological Survey of the entire State was proposed. Massachusetts, holding an interest in the Public Lands, only as State property, without any right of jurisdiction, desired only a reconnoissance of those tracts of land which border upon the great Rivers, and by consent between the Executives of the two States, such a survey was instituted, and has been completed, so far as is desirable in the present state of the country in question.

The lines of our survey followed the St. Croix to its sources, and continued north by Houlton, along the St. John river to the Madawaska. Thence returning by the Military road from Houlton to Bangor. This section having been explored in the year 1836.

During the next season, a more thorough and extended survey was made by myself and assistant, one section having been surveyed by him from Bangor by a due north line to the shores of the St. Lawrence, thence returning by the St. Francis and down the St. John.

The Assistant returning met me at Bangor, by agreement, and after making a minute examination of certain portions of the settled parts of the State, the results of which are embraced in the second Annual Report on the Geology of Maine, I joined with him in the exploration of the West branch of Penobscot river, to Mt. Ktaadn; then ascending the East branch and the Seboois, crossed over to the Aroostook river, which was explored from near its sources at La Pompique, to its confluence with the St. John. The Aroostook river at that time was but little known, but very few persons having navigated its waters or explored its banks. Hence, when it came to be publicly known, through our second Annual Report upon the Public Lands, (which is a sequel to the Report last mentioned,) attention was awakened to the vast agricultural resources which it afforded, and many people whom the severity of the times had thrown out of employ, and who were about to emigrate to the western States, were induced to look at the Aroostook country.

The results of their examinations confirmed most fully the statements which I had made, and the tide of emigration turned eastward. The land law enacted by the last Legislature afforded great facilities to actual settlers, and the banks of the Aroostook soon resounded to the axe of the enterprising pioneer. A demand for the lands in that region was created, and the average sales as reported in the returns of the worthy Land Agent, E. L. Hamlin, Esq. far exceeded the minimum price fixed by law, and the State has realized $9,4[illegible] from the sales of 12,827 acres of Aroostook land. With the opening of the new road, now in progress, the settlements will be augmented by emigration thither from other States, and my predictions with regard to the territory in question, will be fully realized.

Not only has the State saved to herself a number of her citizens who would otherwise have emigrated to the West, but she has also *secured the possession* of a valuable tract of country unjustly claimed from her by a foreign power.

Farther explorations upon the tributary waters of this river were recommended, and my scientific friend, Dr. Ezekiel Holmes, was appointed to the task. The results of his agricultural researches, as I understand, coincide with the observations recorded by me, and he has been enabled to give additional information of value, an account of which will be laid before you.

It becomes us to state that the Geological Survey, so far as it has been prosecuted, has been a most profitable investment. The Public Lands have been augmented in value, by spreading information abroad respecting their nature and capability of cultivation. The value of individual property, the aggregate of which forms the sum of the State wealth, has been greatly increased; new resources have been discovered, and the extent and value of those but little known, have been ascertained and reported. Mines and minerals which, when wrought, will bring a large capital into the State, will serve to relieve the community generally, by creating more taxable property, and thus removing a share of the public burthen from the shoulders of every individual.

Materials now imported at a high cost, will be produced at a cheaper rate within the limits of the State, and domestic industry, skill and capital, will be brought forward. Iron and glass may be manufactured advantageously in Maine, and these two articles are of more general use, and require more expenditure, than any others imported into the State. It will be hereafter a matter of astonishment that Maine ever had to import her iron and glass, as much so as that she formerly did not supply her citizens with bread. Slate quarries, equal if not superior to those of Wales, have lain neglected in Maine for ages, while the houses of Portland, Bangor, and even the State House itself, are covered with foreign slate.

The immense deposits of roofing slate upon the Piscataquis river, at Williamsburg, Brownville, Barnard and Foxcroft, will now be wrought, and from the statistics obtained respecting the slate quarries of Wales, which have lately been examined by Captain Isaac Gage, of Augusta, there can be no doubt that profitable investments may be made in the slate quarries of Maine.

Since a new demand for lime has been created for agricultural use, it became very important to know whether the interior of the State possessed valuable beds of limestone, for it is evident that the farmers could not use lime extensively on their soil, unless it could be obtained at a low price. We are enabled to point out immense and inexhaustible supplies of this useful substance, in the very regions where it is most required, and to demonstrate its capability of answering for every ordinary use.

I have been busily engaged in drawing up a geological map of the State, on which the various rocks and mines will be represented by conventional colors, which will be explained by an index. The map will show the ground plan, and for a more full elucidation of the structure of the country, sectional profiles, shewing the dip and direction of the rocky strata and their order of superposition, are in course of preparation. Beautiful views of scenery, and sketches of peculiar geological formations, are also in progress, and al-

these plans and views must form an Atlas for the final and complete Report.

Maine has already gained great credit for her liberal views in undertaking a Geological Survey of the State, and so important has the work proved to the community generally, that it is to be hoped that she will carry it forward to its full completion.

Most respectfully,

Your obedient servant,

C. T. JACKSON.

THIRD

ANNUAL REPORT

ON THE

GEOLOGY OF MAINE.

1838.

Having prepared myself for the continuation of the Geological Survey of the State of Maine, I left Boston on the 21st of May, and proceeded directly to Augusta, where I obtained from Governor Kent such pecuniary means as were required for the survey of the first section. I then took passage in the steamboat for Portland, where I met my Assistant, Dr. S. L. Stephenson, and made arrangements for the service which we had engaged to perform. Rev. Solomon Adams, a gentleman who has on former occasions aided us in our barometrical measurements, again kindly volunteered to perform a similar task, and our instruments were most carefully compared side by side, and the slight difference was noted, as will be seen in our tables. In order to know the exact height above the sea level, at which Mr. Adams's barometer was placed, after measuring it by difference of atmospheric pressure, I requested Captain Hall to aid me in determining it precisely by the levelling instrument, which work he most readily and freely performed, and the difference between barometrical and the usual method of levelling was but 1.8 feet. Such an error arises

from the difficulty in noting small differences in the height of the mercurial column, and would be no greater in the measurement of a mountain several thousand feet high. The results of our former operations confirm the correctness of this statement. After agreeing with Mr. Adams, as to the hours of observation, I visited Messrs. Lowell & Senter, and regulated a good chronometer watch to the mean time of Portland, by their transit observations; after which, the Assistant and myself set out for Augusta, where we met Mr. Wall, the additional Assistant, who had, under orders of the Governor and Council, procured for our use a good horse and covered waggon.

Equipped with the usual instruments, our party set out in company, for that portion of the section, which we intended to survey, between Augusta and the Canada Frontier. The immediate vicinity of Augusta having already been explored, we proceeded on our route towards Waterville, stopping to examine every rock that shewed itself above the surface on the way.

About half a mile north from the Augusta Bridge, we examined a ledge of rocks, where the quarrymen were engaged in obtaining rough stone for the dam. The rock is composed of strata of mica slate, which alternate with layers of impure limestone, and numerous veins of granite, containing crystals of black Tourmaline, cut across the strata. The mica slate runs N. E. and S. W. and dips 80° N. W., while the granite veins run N. 30° E., S. 30 W. This rock is suitable only for rude constructions, since it does not split into regular sheets. The soil, doubtless, is enriched by its decomposition, but it does not contain a sufficiency of lime for the kiln. There being but little of practical interest at this place, we continued our route to Sidney, where we examined the tertiary clay used for making bricks, and measured the direction and dip of all the rocky strata that crop out on the way.

WATERVILLE, situated upon the western banks of the Kennebec river, at Ticonic Falls, in latitude 44° 32^m 26^s north, and longitude 69° 37^m 45^s west from Greenwich meridian,

according to the observations of Professor Keely, and 153 feet above the level of the sea, by our barometrical measurements, is an interesting region, which demanded a share of our labors. This beautiful village is the seat of Waterville College, an institution of the Baptist order, having several learned professors, whose aid in the survey we most thankfully acknowledge. Professor Keely, having a good barometer and all the requisite instruments, was requested to furnish a series of observations for the purpose of aiding in measuring a sectional line along the borders of the Kennebec, which service he most cheerfully performed, all the instruments having been duly compared, and their difference noted, as will appear in the tables which are contained in the present Report. This gentleman has also undertaken a series of observations on the variation of the magnetic meridian, which will be of great value to surveyors and engineers. In 1835, he ascertained the variation of the compass needle, at Waterville College, to be 12° 8^{m} west of the true meridian. But since the degree of variation is constantly changing, it will be of great interest to have a continued annual series of observations, and those made by Professor Keely will be exact. Whoever reflects of the difficulties that arise in running the boundaries of estates, and the troubles of litigation that follow, will rejoice in the prospect of having true records on this subject, and we have made arrangements to form a complete series of observations, to settle the magnetic variations on every parallel of latitude and longitude in the State.

Professors Adams and Loomis contributed their aid in the exploration of the geology of Waterville, as did also a number of gentlemen in the village, to whom we here present our grateful acknowledgments. Ticonic Falls first demanded our attention, on account of the discovery of the prints of fern leaves on the rocky strata at that place, which have been formerly noted. (Vide First Annual Report, p. 107.) We therefore proceeded thither, and made all the necessary researches. The Kennebec river is there observed rushing

through a breach, which has been formed by the disruption of stratified argillaceous slate, the strata being turned up, so that on the western side of the river they dip to the N. W. 60°, while on the eastern side the inclination is to the S. E. 80°, the direction of the strata being N. 56° E., S. 56° W. by the magnetic needle. The fall of water is from a ledge of these rocks, and varies from eighteen to twenty feet, according to the state of the river. Near the bridge, on the eastern side of the stream, there are two beds or dykes of protogine rock cutting through the strata which have been distorted in a remarkable manner, shewing that they have been acted upon by the violent injection of this formerly molten rock. The strata of slate below the bridge, run N. 52° E. and dip 72° S. E., while the intruded protogine dykes run N. E. S. W., their line of bearing not coinciding exactly with the stratified rocks. The width of the dyke above the bridge was measured, and found to be ten feet.

Veins of yellow silicious limestone traverse the slate strata, but they are not of sufficient importance to prove valuable in the arts. Analyzed, this kind of limestone is found to contain

40	per cent of silex,
50	" " " carbonate of lime,
10	" " " oxide of iron.
100	

From its composition, it is evident that it will not answer for lime, since it would run into glass at a high temperature. It might, however, if in sufficient quantity, be advantageously used for making hydraulic cement, since it contains the proper materials, and in right proportions for such an article. I shall, however, have occasion to mention inexhaustible localities of this material higher up in this section, and merely note the composition of the present small veins, to cause attention to be paid to more extensive deposits, that may be hereafter discovered, by knowing the appearance of the mineral, specimens of which are easily obtained, they being used by the people for hones or whet-stones, owing to the silicious grit they contain.

After making a general exploration around the falls, we devoted a day to the searching for fossil impressions on the slate strata, and found a number of specimens on the western side of the river. They are very faint and shallow impressions of the stems and leaves of plants, allied to the genus of fossil ferns, called by Brogniart Odontopteris, and are evidently associated with more abundant remains of fuci or sea weeds. From the fact that all the fern leaf impressions are represented on the strata in drooping fronds, generally much distorted, and from their association with marine relics, I am satisfied that the ferns did not grow on the spot where we find them, but were brought down by some ancient river, from higher land, at the time when the present slate rocks formed the clayey bottom of an ancient sea. Hence the strange occurrence of land plants in so ancient a deposit as the Waterville slate, which does not belong to the coal formation, but reposes directly on the primary rocks, and is itself of the elder transition formation. This conclusion was subsequently proved by our researches farther up the great Kennebec section.

During our stay at Waterville, we also visited numerous other localities which I shall now describe. Several gentlemen having given their opinions in favor of the occurrence of limestone in West Waterville, I proceeded to explore every locality where there was any probability of its occurrence.

On the estate of Mr. Baxter Crowell in West Waterville, near the outlet of Snow's Pond, 5 miles W. S. W. from Waterville Colleges, there occurs an important deposit of limestone, suitable for agricultural use and for ordinary mortar. The limestone exists in regular strata alternating with argillaceous passing into micaceous slate, and the strata are nearly equally divided by the rock, so that the limestone is easily separated from it. The direction of the strata was measured, and found to be N. 52° E., S. 52° W. and the dip is 80° N. W. The width of the calciferous strata is not less than 66 feet, while their length is of unknown but great extent. Having satisfied myself as to the quantity of limestone, I obtained a set of specimens for the institutions provided for by

law, and since that time I have made a chemical analysis of the rock, and have ascertained that it will burn and slake sufficiently well for the uses designated.

Analysis. 100 grains of Crowell's limestone consist of;

Carbonate of lime, - - -	89.8
Carbonate of iron, - - - - -	1.2
Insoluble slaty matter, - -	9.0
	100.0

It contains then 50.54 per cent. of pure lime, and as anticipated from the analysis, I find that it burns well without melting, and makes a light brown lime, which slakes perfectly into a nearly white hydrate, making good and strong mortar. It is evidently a valuable material for agriculture, and the soil in the vicinity requires liming to a considerable extent, since it is diluvial and nearly destitute of lime.

The rocks at West Waterville Falls are composed of strata of blue limestone and argillaceous slate alternating with each other, but separating easily when struck with the hammer. The quantity of good limestone that will answer for agriculture, is immense, and the following analysis, which I have made since the field services closed, shows its value.

Carbonate of lime, - - -	73.8
Carbonate of iron, - - - - -	1.4
Insoluble slate, - - - -	24.8
	100.0

It will bear a full red heat, and forms a brown colored lime that will answer for ordinary uses, and will prove an excellent dressing to the neighboring granite soils.

It is evident from the foregoing remarks that there is an ample supply of good agricultural limestone at Waterville, and that since the quality of the rock is now ascertained, it may be safe to erect kilns for converting it into lime for the amelioration of soils. The comparatively low price of wood in the vicinity will enable the people to make their own lime much cheaper than it can be obtained from the localities now wrought on the sea coast.

Returning to the village of Waterville, we observed several naked ledges of slate distinctly marked with diluvial scratches, which run N. 5° E. by the magnetic needle. They occur in the vicinity of Crowell's farm, in West Waterville.

After examining a number of localities of poor limestone, and argillaceous slate, on each side of the Kennebec river, at Waterville and its immediate vicinity, we set out for Skowhegan Falls, exploring the rocks along the road and river side, wherever they shew their out-cropping edges. The slate rocks are seen in numerous places along the route through Fairfield, and at Skowhegan Falls large quantities of limestone occur, imbedded in the slate. At Bloomfield, we became acquainted with Mr. E. Weston, who shewed us a number of specimens of limestone, which he had found in that region. Since we intended to return to that place, but little time was then spent in the examination of the ledges, but subsequently we explored them more minutely.

There are extensive beds of limestone at Skowhegan, fair specimens of which were collected for the State Cabinet, and an average suite were subjected to chemical analysis, which furnished the following results:

Carbonate of lime, . . .	53.8
Carbonate of iron, . . .	7.6
Insoluble mica and slate, . .	38.6
	100.0

From this analysis, it appears that the limestone is not rich, or suitable for plastering, but will answer for a dressing to soils. Some specimens prove much richer in calcareous matter, than this variety, but we had not specimens of them in season for analysis in the laboratory. Owing to the low price of wood at Skowhegan—($1 per cord)—it will be economical to burn this limestone, especially since the Thomaston lime costs the people from $2.25 to $3 per cask, owing to the expense of transportation.

Skowhegan Falls are produced by the falling of the Kennebec over a rocky ledge to the distance of from ten to twelve feet. The village is picturesque, and it is an enter-

prising and flourishing town. The following sketch of the Falls was taken by the draftsman, (G. T. Devereux,) during our stay at Skowhegan.

Skowhegan Falls.

During the fatal campaign of Arnold, his army encamped upon an island near the Falls, and occasional relics of the encampment are now found, such as pipes, coins, &c.

From Skowhegan we proceeded to Norridgewock, where we found several beds of good limestone, the strata of which are included in those of argillaceous slate, and run N. 52° E. and S. 52° W., dipping to the N. W. 65°. The locality where these observations were made, is one fourth of a mile N. W. from Pike's Hotel.

A specimen from the estate of S. Sylvester, of Norridgewock, submitted to chemical analysis, gave the following results:

100 grains analysed—

Carbonate of lime,	88.2
Carbonate of iron,	1.2
Insoluble (mica and silex)	10.6
	100.0

It is evidently a good limestone, and will average better than the specimens above analyzed, since it contains veins of

pure calcareous spar, which were excluded in the analysis. In order to ascertain how it would behave in the kiln, I burned a large specimen, and found that it would bear a full red heat, without melting in the least, and that it came out of the furnance a mass of solid and good lime, of a light brown color, slaking completely with water, and making a good strong mortar. In slaking, it gains 40 per cent. weight of water, which indicates its capacity of bearing as full a proportion of sand as any lime in use. The low price of wood, and the expense of carting lime from the sea coast, are sufficient inducements for the inhabitants of Norridgewock to make their own lime from this rock. The soil of that town, as will be seen in our analyses, is deficient in lime, and the great benefit arising from its use, is now too fully appreciated by the farmers, to allow the locality to be neglected.

At Norridgewock Falls, the Kennebec river precipitates itself about ten feet, over ledges of hard argillaceous slate passing into mica slate and a fine grained grau-wacke containing crystals of pyrites and specks of iron ore. The stratified rocks dip to the N. W. 80°, and run N. 70° E., S. 70° W. On these Falls there is a large mill for grinding wheat, a clothing and a saw mill.

Returning from the Falls, we next visited the farm of Mr. Wetherell, who informs us that his soil produces an average crop of 15 bushels of wheat to the acre, and 200 bushels of potatoes, and 40 of corn. The soil is a loose yellow loam. The rocks around are slaty limestone and mica slate. Lime and gypsum mixed are used by him for a manure, which has had a good effect, even in the small proportion of one cask to the acre.

The farm of Dr. Bates was also examined, and specimens of the soil were taken for analysis.

Leaving Norridgewock, we visited Mercer and New Sharon on our way to Farmington, where some days were spent in the examination of the country.

Farmington, the shiretown of Franklin County, is situated, according to our observations, in the latitude 44° 37m 30s N. It is a large and enterprising village, the inhabitants depending

mainly upon their rich alluvial soil, for support. The Sandy river, bordered with rich farms, producing an abundance of grass and grain, gives a pleasing aspect to the country. In this town, we met several active and intelligent gentlemen, who generously devoted their time and attention, during our stay, to the objects which it was our duty to explore. Dr. J. Prescott, Hon. Hiram Belcher, and several others, devoted to us a large share of their time, and rendered efficient services. Limestone being a great desideratum with the farmers, I examined every locality where it might be expected to occur, and found several beds which will answer for the purposes of agriculture. Visiting a locality called Stoyer's pasture, belonging to Mr. H. Titcomb, a little eastward from the village, we found the limestone strata running N. 30 to N. 40° E. and dipping N. W. 78°.

Another locality near by, on the land of J. Coney, was also examined, where a limestone of good quality was found, composed as follows—In 100 grains,

Carb. lime, - - -	84.4
Oxide of iron, - - -	1.2
Mica slate, - - -	14.4
	100.0

This rock burns well at a full red heat, and slakes perfectly into a light brownish white lime. It will make a strong mortar, and is suitable for agricultural purposes. Its abundance offers inexhaustible sources of valuable matter for the enterprising farmer.

Norton's Ledge, in Farmington, presents many interesting phenomena. It is a hill, composed of mica slate, containing an enormous quantity of iron pyrites, and rising abruptly to the height of 380 feet above the plain. The soil having been swept from the summit of the hill, presents an infinite number of well characterized diluvial markings or furrows, which run nearly North and South, while the strata of the rock have a N. E. and S. W. direction.

So distinctly are these scratches worn in the ledge, that they will remain clearly visible for ages, and bear testimony

that a great current of waters once passed over the surface, and carried along with it huge masses of granite, which left their marks on the rocks as they glided over.

This rock, from the quantity of pyrites it contains, may be used in the manufacture of copperas, or sulphate of iron; but large quantities will not be required, until manufacturing establishments are erected in the neighborhood; for it is a low priced and cumbersome article, which would not give sufficient profit, if carried to the sea-coast, to be shipped to other States.

In order to correct the topography of our maps, I took a set of bearings and altitudes of some mountains, from this hill.

Mt. Blue bears N. 66° W. Angle of elevation, 2° 24m.

Bald Mt. bears N. 95° 30m W. Angle of elevation above horizon, 1° 12m.

Centre of Mt. Abraham, N. 15° W.

Dead River Mt. (east of Mt. Abraham) N. 12° W. Angle of elevation, 1° 19m.

Saddleback Mt, N. 34° W. Angle of elevation, 1° 55m.

Comparing these observations with others, which we shall present, the true places of the mountains in question will be fixed, by the intersections of the lines of bearing, and knowing their distances, the angles of elevation will give their height.

Another point, in Farmington, afforded us a station for additional observations; but the base is not sufficiently long for a final triangulation.

Powder House Hill, is the point in question. Measured barometrically, it is 208 feet above the plain of Farmington. From this hill, Mt. Blue bears N. 59° W. Mt. Abraham, N. 12° W.; angle of elevation, 1°, 30m.

Powder House Hill is composed, like Norton's Ledge, of pyritiferous mica slate; the strata run N. E., S. W. and dip nearly vertical. Diluvial marks are very abundant, and are deeply cut over the whole ledge. They run N. 10° W.

The decomposition of pyrites produces sulphate of iron, which is dissolved by water, and carried down into the

meadows and bogs, and there the per oxide of iron is abundantly deposited, owing to decomposition of the sulphate by vegetable matters, and lime contained in the soil. Thus, as expected, a considerable quantity of bog iron has been formed around the hills of Farmington.

A specimen of this ore, presented to me by Dr. Prescott, contains in 100 grains:

Water, . .	7.0
Silica, . .	17.5
Per oxide iron, .	64.5
Vegetable matter—(Ulmine,) and manganese	11.0
	100.0

Such ores are stated to be abundant in the low grounds, but owing to the quantity of water in the bogs, we were unable to make the necessary explorations. So good an ore as this, if it really is abundant, will prove a valuable article to the inhabitants, for it will yield 44 per cent. of iron.

When the most important minerals of Farmington had been examined, we set out on an excursion to Mt. Blue, a number of gentleman from the village accompanying us. Our objects were to measure the altitude of the mountain, and to obtain bearings of important points, for the purpose of correcting the Map of the State. The rocks and minerals were all duly examined of course.

By a great number of observations, we first ascertained the height of Farmington, then of Avon, and afterwards that of Phillips; and from these points we were enabled to prove the correctness of the barometrical measurements, by means of triangulation with the azmuth and altitude instrument.

Strong. In this town we examined the farm of Thomas Stephens, called the Eaton farm, where there occurs a mineral spring, charged with sulphuretted hydrogen, which has considerable celebrity for its medicinal virtues in the treatment of cutaneous diseases. The water is free from mineral substances, and is extremely soft, communicating a smoothness to the skin, which is quite remarkable. Chalybeate

springs also abound, and are highly charged with the carbonate of iron.

On the road side, there occur great masses of rocks, composed of garnets cemented together by a granitic paste, some of the boulders weighing twenty or thirty tons. These erratic blocks came from some mountain, not far to the north, and were removed from their native beds and swept southwardly by a powerful diluvial current.

In the town of Avon, there lies on the left hand side of the road, as you enter the town from Strong, a granite boulder which measures 30 $\times$ 20 $\times$ 15 feet, equal to 9000 cubic feet, or 643 tons. This granite block is evidently out of place, and was brought several miles by the above mentioned current, it probably having been driven by ice and water from the granite mountains of the Mt. Abraham range. Mt. Abraham is seen from this point, rearing itself majestically in the north, while Sandy River, with its verdant banks, relieves the savageness of the mountain scenery.

After dining at Bates's Tavern, in Avon, we set out for Mt. Blue, and reached its base at 6, P. M.

At the house of R. Worthley, near the base of Mt. Blue, June 12th, 6½ P. M., barometer 28.530, T. 70°. From this station we set out to ascend the mountain immediately. Travelling through a forest of maples, birch and beech, we came next to a dense small spruce growth, more difficult to penetrate. Struggling through this tangled forest, over irregular heaps of moss grown blocks of granite and mica slate, we attained a region destitute of forest trees, and marched more freely over the naked rocks to the summit of the mountain, which we reached at 8 h. 20^m P. M. At 8 h. 30^m P. M., barometer 27.03, T. 68° F.

Night now closed upon us, and we hastened to collect fuel for our camp fire, and pitched a tent on the summit of the mountain, beside a huge rock to shelter us from the wind, while the dense smoke of the fire brought tears into our eyes, but kept the swarms of mosquitoes at bay. Under such circumstances, and while our tent was continually flapping its half tied wings, sleep was almost out of the question;

so we most cordially saluted the rising sun. June 13th, 5 A. M., the barometer stood 27.00, T. 60° F. temp. of air 60° F. Calculating our observations, it appears that Mt. Blue is 2421 feet above Bates's tavern, in Avon, and 2804 feet above the level of the sea.

When light appeared on the world below, we prepared for a series of trigonometrical measurements, which were made with Kater's circle. 7 A. M., 13th June, barometer 27.00, T. 63, temp. of air 63°.

The centre of Webb's Pond below horizon, 4° 40^m [illegible] 106° W.

Saddleback Mountain, N. 19° W.

Mt. Abraham, eastern Peak, N. 20° E. Angle elevation, 1[illegible]^m.

Central Peak Mt. Abraham,	N. 17° E.	
Western Peak,	N. 14° E.	
Phillips Village, (lower vill.)	N. 10° E.	
Farmington Village,	S. 56° E.	Angle depress. [illegible]°.
Wilmington Village,	S. 20° E.	" " 2° [illegible]^m.

9 A. M., barometer 27.04, T. 64° F. t' 17° cent.

10 A. M. After examining all the surface of the mountain which was accessible, we found it to be a barren mass of gneiss and mica slate, containing a few crystals of staurotide, but destitute of other interesting minerals; and since but little was to be learned by remaining longer on its summit, we descended; and on reaching the mountain's base, stopped to dine at the house of Mr. Ingraham. At noon, barometer h. 28.600, T. 73, t. 23½ cent. Continuing our descent, we reached the house of Mr. Dow, when barometer 28.730, T. 88°.

On our way to Phillips, we examined the peat bogs of Mr. Ichabod Foster, where there were five or six acres of excellent peat, of a remarkable character, it being in part bituminized by the process of decomposition. The peat may be advantageously used for making compost, since it is in the state of a very fine pulp, and very soluble.

The diluvial and alluvial soil in the vicinity, are rich and productive, but subject to early frost. Beds of plastic clay, also occur near the peat bog.

PHILLIPS. We reached this pretty village, 5 P. M., and took lodgings at Whitney's Hotel.

June 13th, 5½ P. M., barometer 29.680, T. 80° F. From our observations, the height of Mt. Blue above Phillips, is 2067 feet.

View of Mt. Blue from the village of Phillips.

14th, 7½ A. M., we set out on an excursion in company with Dr. Blake and several gentlemen of the village. Phillips is situated amid an amphitheatre of large mountains of primary formation, while the rocks in the town are of the metamorphic varieties of micaceous and argillaceous slate, containing numerous and powerful beds of limestone. The intervale soils, on the Sandy River, which passes through the town, are very rich and fertile, repaying amply the labors of the husbandman. The state of vegetation may be understood by the fact that on the 14th of June, peas were in full blossom in the gardens, and the young corn was three or four inches high in the fields.

There are many beds of limestone within the limits of the town, but I shall describe those of the greatest value only. The first which we examined, is one mile north by west from the village, on the estate of Mr. Joel Whitney. The rock is a greyish white, and a bluish variety of granular carbonate

of lime, and occurs between the strata of mica slate, the course of the bed being with the strata nearly east and west, while its dip is towards the north 60°. The limestone bed is 40 feet wide; or rather there are two beds side by side— one 10 feet and the other 30 feet wide; beside which there are several smaller lateral beds. It immediately occurred to me that the limestone extended much farther than the owners had imagined, and I succeeded in tracing it to the eastward continuously for the distance of 1200 feet. The hill is at least 150 feet high, and presents an abrupt precipitous side to the west, where the limestone was first discovered many years since, and abandoned after a very careless trial of its quality. It may, however, be advantageously wrought, and it is of great importance to the farmers that it should be used, as a dressing to the soil.

Allowing that the lime rock of good quality extends 1000 feet, and that it may be wrought to the depth of 100 feet, its width being 40 feet, we have—1000 length,

$$\begin{array}{rl} 1000 & \text{length,} \\ 40 & \text{width,} \\ \hline 40{,}000 & \\ 100 & \text{depth,} \\ \hline 4{,}000{,}000 & \text{cubic feet,} \end{array}$$

Or, if but 50 feet depth be allowed, we shall have—

$$\begin{array}{r} 1{,}000 \\ 40 \\ \hline 40{,}000 \\ 50 \\ \hline 2{,}000{,}000 \end{array} \text{ cubic feet.}$$

Hence, we may safely calculate, that no less than one million casks of lime are contained in this hill.

Since lime is so valuable to the farmer, and wood is cheap, there can be no difficulty in making the business of burning lime at this place profitable. It is true, that more care must be taken in burning it, than is required at the Thomaston kilns, but with a little experience, it may be readily accomplished.

The limestone from Whitney's ledge, is composed in 100 grains, of

Carb. lime,	- - -	65. grs.
Ox. Iron,	- - - -	0.4 gr.
Insoluble silica,	- -	34.6 grs.

It requires less heat for burning than pure limestone, but if slowly heated to full redness, will make good lime. Persons interested, will also remember, that at one trial, when their wood had been wet with rain, and burned indifferently, that a good kiln of lime resulted, and that the lime was then used in building and plastering the church at Phillips, and answered very well for the purpose. Why the burning of it was abandoned, does not appear; but it may have arisen from a deficient demand, as lime was not then known in the art of agriculture. It will now probably be again wrought.

There are two large beds of limestone on the west side of Sandy River, and a number on its eastern side, where the county road to Freeman cuts through the top soil, and exposes them to view.

A specimen from the county road, is composed in 100 grains, of

Carb. lime,	- - - - - -	67.
Silica,	- - - - - -	28.8
Ox. iron,	- - - - -	5.6

Boulders of novaculite occur in the bed of the river, in company with argillaceous slate, greenstone trap and granite. But the most remarkable boulders, are those of diluvial deposition, which occur on the hills around. One of those presented to us, was an enormous rounded and water-worn mass of pure magnetic iron ore, exactly like that found in the iron mines of Troy, Vermont. Its origin was, at first, difficult to ascertain, but some information obtained on a second visit to Phillips, reveals a portion of its secret history. It now appears that this boulder was found on the estate of Mr. Joel Whitney, one mile north, a little east from the village. Other masses, still more curious, have been found by the enterprising young gentlemen of Phillips, since our first visit. Some of the veins are contained in their native rock, which

is granite, worn in the same manner as the larger mass above mentioned, thus showing in what kind of rock we may expect to find the parent vein or bed.

The large mass is now much smaller than when it was at first discovered, for considerable portions, equal to one-third its weight, have been removed. It measures one foot eight inches long, one foot wide, seven inches thick, and is irregularly rounded by attrition and the action of water. It weighs now 174 pounds, and is five times heavier than its bulk of water.

The masses included in the matrix, were found on French's mountain, at the elevation of 849 feet above Sandy River. On examining this hill, which is composed of mica slate, there are observed an infinity of deeply worn diluvial furrows, which run N. 50° W., S. 50° E., and all point directly to Saddleback mountain. The loose boulders on the hill are chiefly granite, although a different rock from that on which they now repose.

Here then we have several remarkable phenomena. First, the occurrence of diluvial markings, which do not coincide with the direction formerly noted, as the general bearing. Secondly, the occurrence of extremely heavy masses of iron ore of foreign origin, and granite rocks also erratic, poised upon the summit of an insulated hill. The questions that naturally arise are, first—how came these scratches on the surface of the ledge? And secondly—why, if they owe their origin to causes I have formerly assigned, do they vary in their course?

The answer to the first question, has long since been given, viz: that every portion of Maine bears ample testimony to the fact, that a great rush of waters has in former times, since the consolidation of all the rocks, and since the deposition of the tertiary clays, been poured over the surface of the earth, and has transported by its power large masses of rocks far from their parent ledges, and deposited them in distant regions; and that as they passed along, they wore deep grooves in the rocks over which they travelled. This conclusion, no man of common sense will deny, after exploring

the mountains of Maine—for the characters are too legible and too universal to be slighted or misunderstood.

Secondly, this apparent anomaly in the direction of the diluvial scratches, is a most striking and wonderful confirmation of the theory which we have enunciated; because the shape of the country, as is evident to any observer, would have caused the precise deflection observed in this case; for Mt. Abraham arrested the current on the north and turned it into Sandy River valley on the west, from which deflection it struck against the Mt. Saddleback range, continued to Mt. Blue, and by Saddleback was reflected, precisely according to the well known laws of physics, towards French's Mountain; and thus the marks coincide with the direction of the two forces. It moreover proves incontestably that the current did not set in from the S. E., for the course would have been at right angles with the present markings. The nature of the accompanying boulders, also proves the current to have come in from above Saddleback Mountain. Hence if the marks are diluvial, and the boulders were brought along by the aqueous current, it is evident that the magnetic iron ore could have been brought thither by the same power. The immense weight and density of the ore, particularly the latter, is the greatest difficulty; but the masses shew too evidently that they have been worn, to leave a doubt that their gravity struggled powerfully against the current.

Whence came the ore? is the most important question. This is the more difficult to answer, especially since we have not yet all the requisite data. The direction of Troy is not that of the course made good of the diluvial current; but if we could learn the direction of the Troy vein or bed, then it could be seen whether it would cross our diluvial line; and in such case, the line of bearing of the Vermont ore, intersected by the diluvial line, would be the point in question. The general direction of such beds is N. E., S. W., and hence may cross the corner of Maine a little above the sources of Sandy River, from whence the ore may have been brought. Or it may be that a similar bed occurs on the Saddleback Mountain.

EXCURSION TO MOUNT ABRAHAM.

This mountain is one of the most conspicuous eminences in the State, and presents its lofty peaks to view from the country far around. It became important, therefore, to ascend to its summit, not only for the purpose of examining its geological structure, but also for the purpose of measuring its height and fixing its true place on the map of the State. The extensive view of the surrounding country, also afforded us an opportunity of taking a great number of bearings, and also gave a general view of the geological and topographical contour of the neighboring mountain ranges. It was therefore decided to visit the town of North Salem, at its base, from which its height and distance were triangulated, and then to ascend the mountain.

On the 15th June, we arrived at North Salem, and met several gentlemen who were desirous of accompanying us to the mountain. At the house of Mr. Heath we made the preparatory observations, 15th June, 1¼ P. M., barometer 29,400, T. 82°.

Measured a base line from Mr. Heath's to Captain Hammond's house, 3294 feet, N. 80° E.

From Heath's, the Eastern peak of Mt. Abraham bears North. Angle of elevation 10° 2^m.

Western peak, N. 6° west. Angle elevation 10° 8^m.

From Hammond's, Eastern peak N. 14° W. Angle of elevation 9° 58^m.

Western peak, N. 20° W. Angle elevation 9° 49^m.

These angles calculated, give the height and distance of Eastern peak Mt. Abraham, from Heath's. Distance 13680 feet; height 2470 feet.

A second operation was performed by measuring a line 1000 feet directly towards the mountain.

1st station, Eastern peak—Angle elevation 9° 58^m.

Advancing 500 feet, it was 10° 2^m.

At the forward or third station, its angle elevation 10° 43^m.

This triangulation was made as a check on our other operations. Height 2470 feet.

On the 16th June, at Heath's 5¾ A. M., barometer 29.323, T. 69° F., air 70° F.; light N. W. breeze.

Heavy cumulus clouds rest on the mountain's top and conceal it from view.

7 A. M., barometer 29.390, T. 70°, t. 70°.

Having now several good observations made at the hours agreed upon at the other stations, we set out for the mountain. At its immediate base, we took observations at 8 h. 20^m A. M. in the shade of Mr. Robinson's barn—barometer h. 29.032, T. 74°. Marching up the very steep flank, amid an open growth of hard wood trees, when it was thought we had attained half way up, took another observation—barometer 27.520, T. 73° F. On the summit of the Western peak, the barometer stood at 26.780, T. 66° F., air 18° cent. The Eastern peak is still more elevated, and after making our geological examination of the mica slate rocks, which form the top of the peak, we descended into the valley filled with cedar trees, which lies between them, and forms a thick but stinted forest. Although the weather was extremely warm, we obtained an abundance of ice in this mountainous swamp, where it was still solid beneath the covering of rocks and moss. At 11¾ A. M., we reached the highest pinnacle of the Eastern peak, and there took observations, with all due precautions, to ensure accuracy. The barometer and free thermometer were hung on the shady side of an old stump, and then the preparations were made to take a meridianal altitude of the sun, by the azmuth and altitude instrument. The sun's lower limb was found to be, when at meridian, 68° 42^m. Barometer 26.650, T. 68° F. t. 18° c. Latitude calculated from this observation is N. 44° 56^m.

The following bearings were then taken:

Mt. Blue, S. 22° 30^m W.

Mount Bigelow, N. 12° E. (central peak,) angle elevation 17^m.

Village of Strong, S. 9° E.

Centre of Porter's Pond, S. 25° E.

Berlin Village, S. 50° W.

Phillips Village, S. 34° W.

Farmington, S. 7° E. (powder house hill ?)

Mt. Ktaadn ? N. 65° 30m E.

Moose Head Lake, N. 40° E.

Numerous mountain streams, and lakes and villages, are also seen from this mountain ; but since we did not feel certain as to their names, it is thought unnecessary to mention their bearings.

The mountain itself appears to be almost entirely composed of mica slate, although its sides are covered with myriads of large blocks of porphyritic granite, which has been brought from the high mountains to the northward. Diluvial scratches are very distinctly seen on the top of Mt. Abraham, and run in a N. W. and S. E. direction, owing to the deflection of the current occasioned by the Bald Mountain, immediately north of its summit.

At 3 P. M. the barometer was again observed, and found to stand at 26.660, T. 72° air 70°.

Calculating our observations, we find that the highest peak of Mt. Abraham is 2466 feet above the ground at Heath's, in North Salem, and 2240.1 feet above the immediate base at Robinson's barn. Heath's is 921.5 feet above sea. While from direct calculation from the distant stations, where observations were made at the same time with ours, it is 3387.6 feet above the level of the sea. By a comparison of our different levels, we find the work to be accurate within six feet, which is the sum of error, half which may be allowed as the probable error.

Should the inhabitants of North Salem clear a good path upon the mountain's side, there can be no doubt that travellers would frequently ascend to its summit, for the purpose of enjoying the beauties of the landscape, while it would prove advantageous to the village, should the tide of travel turn thither.

Descending Mt. Abraham, the tube of my barometer was unluckily broken by the shocks to which it was unavoidably exposed in gliding from rock to rock. It was however easily repaired again, since it broke off close to the cistern.

On the road from North Salem to Strong, there may be seen some curious diluvial grooves on the slate rocks, the scratches running N. 46° W., S. 46° E., while the strata of rock run N. 70° E., and dip northwardly. This ledge is on a hill directly south from Mt. Abraham, and there can be no doubt but that mountain range caused a deflection of the diluvial waters. Near the village of Strong, at the Falls, there occurs a blue limestone with veins of calcareous spar. The strata run N. 50° E., S. 50° W., and dip S. E. Receding from the influence of the mountains, the diluvial marks now take their usual course, and in the vicinity of Farmington, run N. 10° W. as usual, over the ledges throughout that town.

18th June, left Farmington for Vienna, by the way of Chesterville Mills, and on our way examined an extensive ledge of white granite, which presents a good opportunity for quarrying stone, to be used in the neighboring towns. The rock splits well, and is free from impurities. Plastic clay and peat abound in Chesterville, some of the bogs having, as I was informed, no less than twenty feet thickness of this valuable substance. It occurs on the estates of Messrs. Keith, Hamblin and Norcross. The rocks are generally mica slate, strata dipping to the northwest, and this rock continues to shew itself until we reach Vienna.

VIENNA. In the southwest part of this town, near the Chesterville line, there are beds of limestone which occur in mica slate rocks, and have been wrought to some extent. They occur on the south side of the McGurdy river, and are now owned by Mr. Orrin Brown. There are two distinct beds of limestone at this place; one runs N. 39° E., S. 39° W., and dips to the N. W. 70 to 80°, and is fifteen feet wide. The other runs N. 40° E., S. 40° W., and is nine feet wide. The quarries can be easily drained to the depth of fifteen feet. There is also another bed, disclosed by the digging of a cellar, at Mr. Lyman Wheeler's house.

The price of wood is only fifty cents per cord, and eighteen cords are required to burn a kiln of lime containing one hundred casks. Lime casks cost from twenty-five to thirty

cents on the spot, and the lime sells for one dollar twenty-five cents per cask, or for one dollar per cask, in bulk. The road to the kiln is however now so bad, that people do not so readily go there for lime as they otherwise would; but this difficulty is easily remedied.

Mt. Vernon. A quarry of limestone is found in Mt. Vernon, upon the estate of Mr. James Chaptman, three quarters of a mile N. E. from the village. It is a bed in mica slate, and runs N. 30° E., S. 30° W. and dips N. W. 45°. It makes a brown lime, sufficiently good for agriculture, and for ordinary mortar.

On the estate of Dr. Dexter Baldwin, in Mt. Vernon, there is also a quarry of granite, of considerable value to the inhabitants. It is a huge vein in the mica slate, and is ninety feet wide, and runs for an unknown extent with the stratified rock, the strata of which it has broken through and distorted in a remarkable manner, evincing the action of heat by the chemical effects which it has produced.

The strata of mica slate run N. E., S. W., and dip in opposite directions on each side of the granite, thus:

shewing the manner in which the strata were disrupted by the intrusion of the unstratified rock.

There are a few specks of pyrites in the stone upon its eastern side, while that on the west appears to be free from any impurities, and is of good quality, splitting well into the forms desired. The rough split stone sells for four cents per cubic foot, on the spot. The whole surface of this granite is covered with scratches, which run N. 10° W., and the surface of the rock has been polished by the attrition of diluvial gravel.

On the road to Readfield, we noted many instances where diluvial marks occur on the rocks. Near the white house belonging to Dr. Hubbard, we observed them on the west

side of the road, running N. 5° E. to N. 8° E. and S. 5° W. to S. 8° W. They are very distinctly cut to the depth of ... an inch, and are occasionally one and a half inches ... I have taken especial care to collect every instance of variation from the usual course, as anomalous facts are frequently guides to discovery.

After reaching Augusta, I directed the Assistants to ... the Cobisseconte stream to Winthrop, and on the 21st ... took passage to Boston, in order to have the broken ...ter repaired.

... Returned to Augusta, and recommenced our Kennebec section, having in the mean time made arrangements ... General Wool, at Moose Head Lake, on the 4th of July, for the purpose of joining with him in the survey of Moose Head Lake and Moose River.

...th June, we measured the height of the tertiary deposits, which form the substratum of a large portion of the valley of Augusta, and found that formation to be from eighty-eight to one hundred feet above the level of high water on the Kennebec river, at Augusta.

During the past year, I had an opportunity of collecting the fossil shells of marine origin, that were disclosed by digging a well in Oak street, and I now found by measurement that the top of the soil at that well, is one hundred and two feet above the river, and since the marine shells were found twenty feet below the surface of the soil, imbedded in marine clay, it follows that the stratum in question is eighty-two feet above the river level. The clay of Gardiner and Hallowell belongs to the same formation, and in the former town, Mrs. Allen has collected a great number of marine shells, large barnacles, &c., specimens of which she has kindly furnished for the State Cabinet.

29th June. Returning to our section, we revisited Waterville, Fairfield and Skowhegan, examining all those localities, that were passed over before in a cursory manner. In Bloomfield, we were interested by observing the rapid formation of gypsum in the soil, by the decomposition of pyritiferous slate containing limestone. The most remarkable

locality is the hill on the road side, in Bloomfield, near the Fairfield line. It will there be remarked that the pyrites, or sulphuret of iron, is decomposed by the action of air and water. Sulphate of iron is formed, which is instantly decomposed by the carbonate of lime, and sulphate of lime and carbonate of iron result. Indeed crystalized gypsum, thus formed, abounds in the crevices of the rock, while large portions of it are washed away and deposited on the soil in the low lands around. Small beds of bog iron, are here observed in the act of formation, the water depositing it over the meadow below.

30th June. At Somerset House, Skowhegan—noon—barometer h. 30.230, T. 73° F. Continued our route to Cornville, where we found the rocks to consist of sound argillaceous slate, which may probably be advantageously quarried, but no openings disclosed its workable quality. The strata run N. E., S. W., and dip to the N. W. 80°. Beds of limestone, from six to ten feet wide, also occur. The surface of the slate is cut by an infinity of well defined diluvial scratches, running N. 6° W. They may be seen along the whole extent of the road, where new excavations have brought them to light.

Rounded masses of fine grauwacke, filled with impressions of marine shells belonging to the genus terebratula, are also abundant, and the Cabinet has already been enriched with a magnificent specimen, of large dimensions, through the kindness of Mr. McDaniel of Cornville. All the boulders of this shell rock, as I have long since intimated, came from the north of the spots where we now find them scattered, and I shall presently describe the parent bed from whence all of them originated, and from whence they have been driven, to the distance of more than one hundred miles, by the great rush of waters before mentioned.

Continuing our route to Athens, we found abundant localities of limestone rocks. On the East branch of the Wesseronset stream, upon the estate of Mr. John Ware, there occurs a bed of limestone of considerable importance. It forms the bank of the stream, and is overlaid by a hard

kind of porphyry rock, that has been thrown up through the limestone, and has produced much distortion in the strata. Diluvial scratches are abundant in this town, and pursue the same course as those last noted. Boulders of granite rock, and grauwacke, containing terebratulæ, abound on the surface, but no such rocks occur *in place* in the town.

Passing over Lord's Hill, the highest rise of land crossed by the road, from whence Saddleback, Mt. Abraham and Mt. Bigelow, may be seen, we reached Harmony, where we spent the night.

HARMONY. Limestone occurs abundantly in this town, on the Higgins stream, near Bartlett's Hotel. The strata run N. 60° E., S. 60° W., and dip S. E. 80°. The limestone beds are included in slate, and vary from four to six feet in width. Veins and nodules of calcareous spar also abound. On the estate of Mr. Norrod Herd, I learned that wheat grew in great luxuriance, the land having been burnt over, but not manured. From three bushels of wheat sowed, he raised seventy-five bushels of good sound grain.

PARKMAN. Passing through this town, we observed that the rocks were wholly of argillaceous slate, the strata of which run E. N. E., W. S. W., and dip S. E. 80°. Diluvial marks are seen on all the rocks, where they have been recently uncovered, and they run north and south. Numerous round blocks and smaller boulders of erratic rocks, such as porphyritic granite, blue quartz rock and flinty slate, abound in the soil, but no such rocks occur *in place* in the town.

Abbot, on the banks of the Piscataquis, is underlaid with argillaceous slate, which may be seen cropping out in nearly vertical strata on the banks of the river and along the road side. Diluvial marks, pursuing the above mentioned direction, abound, and may be seen in numerous places on the road to Monson.

Owing to our engagements, we were obliged to pass over the last mentioned towns more rapidly than I could have desired; but I secured all the facts which I was able to obtain in so cursory an examination. The data are all that

are required in a mere outline sketch, and the filling up must be done at another time. In sectional outlines it is always more easy to keep up a connected view, by tracing thus rapidly our line of march, for the attention is confined to the most important features, and not distracted by thousands of minute particulars, which find their place in the subsequent details of the complete survey.

Arriving at Monson, we stopped for the night at Rice's tavern, where, at 5 P. M. July 1st, barometer h. 29.450, T. 65°. Next morning, July 2d, set out for Moose Head Lake, travelling over a miserable winter road, made up of mud, logs and water, which made the travelling very troublesome. This road has, however, a good hard bottom, and could be easily turnpiked and made suitable for carriages. Should this be done, Moose Head Lake would soon become a favorite place of resort. At present it is only passable for travellers on foot or on horseback, excepting in winter, when the snow furnishes a universal rail-road over the roads of Maine.

The only rocks on the road are argillaceous slate, which stand in nearly perpendicular sheets, and are scratched by diluvial marks over its edges, nearly at right angles with the strata.

After travelling over such an unpromising road, the traveller is delighted to find, on the shores of the lake, the spacious and excellent hotel, kept by Mr. Gore, whose attentions are always polite towards his guests, and his accommodations ample and good.

The plantation at the foot of Moose Head Lake, is called Greenville, and is yet almost an unbroken wilderness, excepting the tract of land cultivated by Messrs. Gore. The beautiful Moose Head Lake will ere long become a favorite place of resort for the citizens of Bangor, and for travellers who have time to spare for their amusement or improvement in health. With the clearing away of the forests, the black flies and mosquitoes that now annoy us, will disappear, and there will be nothing to alloy the pleasures of this beautiful watering place.

By observations with Kater's circle, I find the latitude of Gore's Hotel to be N. 45° 23′ 49″—variation of the compass 11° W. The military gentlemen whom we intended to meet, not yet arriving, on the 3d July we took a boat and made excursions to a ledge called Burnt Jacket, on the eastern shores of the lake. Passing an archipelago of small but picturesque islands, we soon came in view of the majestic Squaw mountain, which rises boldly more than one thousand feet from the lake level, and is surrounded by many smaller mountains.

View of Squaw Mountain from Lily Bay.

Landed upon Ledge Island, which is composed of granite rocks, and is covered with spruce trees and small underbrush. After taking some bearings and sketches from this island, we rowed up to Burnt Jacket, which is a precipitous mass of gneiss with granite veins, rising one hundred feet perpendicularly, containing black tourmalines and andalusite crystals. From this ledge numerous sketches and bearings were obtained.

The shores of the lake, far as we could see, were covered with a dense forest of spruce pine, maple and birch trees, the black growth, as it is called, being most abundant. The

scenery is picturesque, but an *amateur* of fine views would find it yet too wild, and not relieved by the habitations of man; an evil which time will remedy.

Returning to Gore's, I took a careful set of observations to determine the altitude of the Lake above the sea level, and upon the mean of many exact measurement, made under the most favorable circumstances, I find it to be exactly 960 feet above the high water mark of Portland harbor.

4th July, General Wool, Maj. Graham and Lieut. Johnson arrived, and having engaged the use of the steamboat for their excursion, politely invited us to accompany them around the Lake, for the purpose of making a general reconnoisance. This invitation was gladly accepted, since it gave us an opportunity of effecting our objects in much less time than it would otherwise have required, and also afforded us an opportunity of obtaining much valuable information from those distinguished gentlemen. The additional Assistant and Master Chandler, were sent to meet us with the waggons at Moose River, while Dr. Stephenson and myself, with two boatmen, joined the party in the steamboat. Cruising around the shores of Moose Head Lake, we took cursory views of the country, and made sketches of the scenery. On the shores of Northwest Bay, we examined ledges of green calciferous slate, which runs E. and W. and dips N. 60°.

From this point, Spencer Mountain bears S. 35° E. Squaw Mountain S. 23° E. Mt. Kineo, Jr. S. 18° E.

July 5th, at noon, Barometer 29.090, T. 75° F. In the afternoon, we took a boat and ran up a small sluggish stream, for the distance of quarter of a mile, when we came to the new road which it was contemplated to fortify. This road has been cut through a dense forest of pine, spruce and birch trees, which have been cut close to the soil, so that it is a good winter road. The soil is a light yellow loam, containing fragments of green slate, but no rocks in place were observed. We walked up this road three quarters of a mile, and then returned to the steamboat, the General having made up his mind that he should not recommend a fortification there at present. We then ran down to Moose River, and as the

weather was rainy, had no opportunity of making any more observations until we left the Lake.

6th. Leaving the steamer, we took our battaux, and set out for a cruise up Moose River, to the Canada Road. For the first two or three miles of this stream, the water is sluggish and deep; we then came to rapids, produced by the rushing of the waters over siliceous slate ledges containing veins of quartz. After passing four or five similar rapids, we came to Brassau Pond, the shores of which are composed of grauwacke slate, containing obscure remains of shells. The strata dip S. E. 50° or 60°. Numerous boulders of greenstone trap also occur. The Eastern shore is composed of granite rocks, and is covered with a dense growth of small poplar trees and white birch, which indicate a poor soil. Farther up the Lake, we came to dense forests of cedar, spruce, birch, maple and pine trees, and the rocks are grauwacke slate.

July 6th. Barometer 29.024, T. 80°.

After dining on the shores of the Lake, we continued our voyage along its eastern side, against a brisk northwest wind, that nearly filled our boat with water, and required no small labor to bail it out. The forests here begin to become more luxuriant, and Norway and Sapling pines, of good size for timber, abound. The rocks continue of the same character, being grauwacke strata, which run for some distance nearly in the direction of our course.

Moose River opens into the southwest side of this Lake, and we soon entered its waters and ran up to rapids, where we left the boats to be carried by, and walked along a logging road in the forest beside the stream, for the distance of three miles—when we encamped just below the Great Rapids. Already, our faces were so bitten by the immense swarms of black flies, mosquitoes and midges, which were unusually abundant and venomous, that it was more difficult to open than to close our eyes, and we slept easily by our camp fires, the smoke of which defended us from further annoyance from these troublesome insects.

July 7th. This morning walked two miles above the Falls while the boats were hauled over—then took the passage on Long Pond, which is but an expansion of Moose River, and is eight miles long.

7th, at noon, on Long Pond, Barometer 20.950, T. 75°.

The shores of this Lake are of flinty slate, greenstone trap and quartz rock, the strata continuing to the head of Long Pond—which Lake is eight miles in extent in an east and west direction. Ledges of argillaceous slate, which dip N. W. 60°, present themselves. On the West side of the Pond, there is a fine timber lot, belonging to Mr. Coburn, of Skowhegan. Two cleared spots were covered with an abundant crop of oats and grass. On the south side of the Pond, cedar and pines abound.

Mr. Coburn informs me that his lot lies between Long Pond and the Canada Road; that it cost him two dollars per acre, and since he came in possession of it, he has cleared the wood from twenty-five acres, at the cost of twelve dollars per acre, or 300 dollars. On the first year after clearing, he raised on the land hay and grain, which he soldfor 600 dollars, and for two years following he sold the produce for 250 dollars per annum. Exclusive of the cost of cutting, his hay sold for 25 dollars per ton. The land, at the time we were there, was covered with oats and grass, which were in thriving condition. From this statement, it would appear that good investments may be made by clearing farms on this river.

A road ought also to be made from near Moose River Bridge to Moose Head Lake, since it would become the most direct route from Bangor to Quebec, and would run through a country that will soon be settled, since the soil is luxuriant. Moose River may hereafter be made navigable, by canals around the Falls, and it can easily be done at little cost, when the settlements require it.

After examining the country, as well as we could in our rapid mode of travelling, we continued our voyage to Moose River bridge, where there are settlements. Thus far our voyage on the river has been 30 miles, and still I was

informed by the boatmen, that we could run 40 miles further up this stream, in a westerly direction from the bridge. So remarkable a stream as this, ought to attract more attention, for by very little expense, it may be made navigable to tow-boats, the river's banks furnishing a very good tow-path, and there being but few rapids—while for the greater part of the way the water is quite sluggish and deep.

Leaving the boats at the bridge, we went to the house of Jacob Lowell, where we remained for several days engaged in the requisite operations of the survey. Lowell keeps the Custom House, which is fourteen miles south of the Canada lines, and one and a quarter miles north from the bridge on Moose River. The latitude of this spot, according to Maj. Graham's observations, is 45° 39^{m} 4^{s}; and longitude 70° 14^{m} 45^{s} West from Greenwich. Barometer 28.918, T. 73, t. 73° F.

July 9th. Leaving the Custom House, near Moose River bridge, we travelled up the road to the height of land dividing Maine and Canada. For the first three miles the slate ledges present themselves, inclining to the northwest. The forests are composed of a mixed growth of yellow birch, spruce, pine and beech trees; then we come to an abundant hard wood growth of sugar maples, yellow birch and beech—indicating a good soil, which being examined, was found to consist of a yellow loam, resting on a substratum of clay. The rocks are calciferous slate, which is stratified and runs N. 76° E., S. 76° W. and dips N.60° W. Approaching the house of Mr. Hilton, the soil becomes of a darker brown color, and is still clothed with maple trees. At this place, the slate strata are reversed in their inclination, and dip S. 10° E. 70°. Diluvial marks abound and run N. 46° W., S. 46° E., Bald Mountain having reflected the course of the current from the north to the eastward.

Hilton's house is situated close to the West branch of the Penobscot river, which is here a small brook, the stream taking its rise four and a half miles from this place, between the "Height of Land" and Sandy Stream Mountain. Meas-

ured barometrically, the West branch of the Penobscot, at Hilton's, is 1660 feet above the sea level.

From Hilton's we ascended to the high-land which divides the Canadas from Maine. On the hill there is a new cottage, formerly kept as a tavern by a French creole, by the name of De Longe. A large sign is here erected upon a post, on the dividing line, the British armorial bearings being painted on the north side of it, and those of the United States on the south. From this eminence, there is a most extensive view of the country to the north and south, the eye reaching over a long vista towards the St. Lawrence, the slope being quite rapid on that side of the line. A conical peak is seen at a great distance, bearing N. 56° W. and 15^m below the horizontal level. On the S. 59° E., in Maine, Bald Mountain rises far above the point where the road crosses the high lands. On the West, there is a high mountain rising at an angle of 1° 39^m from this spot. The direction of these mountain ridges is from N. W. to S. E. and their sides are composed of argillaceous slate, while granite rocks probably form their central mass.

July 9th. The barometer placed at the side of the monument above described, and protected from the sun's rays, stood at 2½ P. M. 27.860, T. 74°, F. t. 22° cent. The instrument was allowed to remain one hour, and was again noted. It stood at 27.880, T. 54° F., t. 24° cent. The weather was fair and serene, and the barometer remained constant. Calculated from the mean height of the mercurial column, with all the due corrections for temperature, curvature of the earth in the latitude given, &c., and comparing with all the line of stations where observations were made for the survey, we ascertain that the Canada road, where it crosses the frontier, is precisely 2000 feet above the high water mark in Portland harbor. The latitude and longitude of this spot were measured by Maj. Graham and Lieut. Johnson, and found to be—lat. N. 45° 48^m 31^s; long. 70° 22^m 54^s West from Greenwich meridian This point in our boundary having been accurately determined, it will be more easy to

:ertain the remaining chain of unmeasured dividing high-ıds.

Returning on our section, I measured the fall of land for ›ry ten miles, from the frontier upon the Canada line to › level of the sea, in the direction following a line parallel the course of the Kennebec river, for the purpose of .king a profile view of the structure of the country and its terior contour. The latitudes on many of its points were curately taken, and as near an approximation to the true ıgitude as can be obtained with a chronometer watch by e meridinal passage of stars. This section will be pre-nted, but ought to be printed on stone or copper plate, th the remaining sections, views, and the geological map, ıich will be reported at the close of the survey.

The soil at the Moose River settlement is generally good, d produces ample crops of wheat and other grain, the erage yield of wheat being fifteen bushels to the acre, on -manured uplands.

On the west side of the Canada Road, about half a mile rth from the Custom House, on No. 5, 2d Range, Messrs. P. Dennis, Hyde, Mitchell & Co. have effected the clearing ' a valuable farm, which has been successfully cultivated ıder the direction of Mr. Dennis. Mr. Hyde informs me at "on fifty acres of this soil, they raised 1065 bushels of od wheat during the past season, and that the average op is twenty-one bushels to the acre. On another spot ey raised rye, which gave on forty acres, 450 bushels of at grain. Sixty acres planted with oats, yielded a crop of 0 bushels. One hundred and fifty acres are now laid down herd's grass, clover and red top; fifteen acres are planted th winter rye.

On this farm, a very large and commodious barn has been ected, 100 feet long and 50 feet wide, and is handsomely ıished and glazed. An excellent Flour Mill, having eansers and bolts, with room also for saw-mill, has been ected upon the Sandy stream, three quarters of a mile ›rthwest from the Custom House, and is capable of grinding ›0 bushels of wheat in twenty-four hours."

From the above statements, it is evident that the soil in this region is rich and well adapted to cultivation, and that profitable investments may be made, by clearing and cultivating farms on the Canada Road. The nature of the soil, as indicated by the forest trees, is evidently strong and good in many other parts of this section, and when the United States erect fortifications and quarter troops on this frontier, there will be a ready demand for the agricultural produce that may be raised on the neighboring farms.

10th July. Leaving Moose River, we travelled on towards the Forks of the Kennebec river. At Capt. Jackman's, ten miles from Moose River Bridge, 6½ P. M., barometer 28.[illegible]; T. 70°, fair. Four miles south from this place, at Mr. Boise's house, 8¾ P. M., barometer 28.350, T. 68°, fair.

11th, at Boise's house, 5½ A. M., barometer 28.220, T. 68° F.; at 7 A. M., 28.230, T. 71° F., t. 21° c., fair.

Boise's farm is near Parlin Pond. The soil is composed of a white siliceous substratum, with a thin layer of yellow loam, and is not very productive. Between Jackman's and Boise's farms, on the side of the road, half a mile north of Parlin Pond, I discovered a huge bed of fine grauwacke, filled with an immense number and variety of fossil shell impressions. The rock is of a fine siliceous variety, extremely compact where the shells do not abound, but presenting the most perfect casts of marine shells that I have ever seen. The width of the bed could not be exactly determined, as it is in part concealed by the soil; but I measured it for fifty rods, which is but a small part of its width. Among the fossils I obtained the following genera terebratulæ, spiriferæ lutrariæ and turritellæ, beside which there are several other indistinct or broken fossils, which it is more difficult to determine. From the direction of this rock, it evidently crosses Moose River and the head of Moose Head Lake, and extends to the banks of the Aroostook, where we discovered it last year, and from it came all those numerous boulders and erratic blocks containing fossil shells, which we find scattered so profusely over the country, from the line above mentioned, to the outer islands of the Penobscot bay, and at the mouth of the Ken-

ebec river. The distance to which masses, six or eight nches in diameter, have been transported, is no less than 126 miles in a right line, while there are immense numbers of larger size found scattered over the intervening space, and they become larger as we approach this their parent bed.

No fossiliferous rock of the kind, occurs in the area between this locality and the spots where are found the diluvial boulders noticed; the marks on the surface of the ledges, have long ago indicated to me that the parent bed of these fossils was to be sought inland, farther to the north than where they are found loose in the soil. We consider this discovery of the most conclusive kind, and one of great importance in the theory of diluvial transportation, both of minerals and soils.

By knowing the direction from whence the scattered fragments came, we can trace rocks and minerals to their native beds, and we can predict and account for the distribution and qualities of soils, which would be wholly obscure without the above considerations. Thus, since all the diluvial soils have been moved southwardly, it is evident that the soil from one rock overlaps that of another, and so far as I have observed, the soils resting on a rock are rarely derived from its decomposition, but from those to the north. This rule indicates their treatment, for their mineral ingredients denote the amendments required. Thus persons who believed the soils of Thomaston to be the result of the decomposition of the rocks immediately below, would be apt to think that they must contain much lime, but they do not, and originated from granitic and mica slate diluvium—and experience, since we have urged the trial, demonstrates that the soil of that town needs liming to a great extent. Hundreds of other instances of the kind, I have recorded, but let this suffice for the present.

Parlin Pond is three miles long, and is supplied by Boise's Stream, which descends from Bald Mountain. There is a stream arising from this Pond twelve miles in length, and communicates with Long Pond. There are numerous falls

upon it, which Mr. Boise informs me amount in all to seventy feet fall. Logs are run down this stream to Long Pond.

Attean Pond is eight miles west from Boise's, and is said to be from six to eight miles in length and three miles wide. It empties into Holob Pond, and into Moose River above the bridge.

Between Attean and Parlin Ponds, there are an abundance of large Norway pines, spruce and larch trees.

Mr. Boise makes his own sugar from the maple sap, and says that he obtains eight pounds of good sugar from a barrel of sap on the first tapping, while the next year, a barrel of sap gives nine pounds of sugar, from the same trees. The quality of the juice increases, while its quantity diminishes by tapping.

From Boise's to the Forks, the rocks are found to consist of argillaceous and calciferous slate, with numerous beds of fine grained grauwacke.

At the house of J. B. Smith, three miles above the Forks of Kennebec, $1\frac{1}{4}$ P. M., 11th July, barometer 28.790, T. 82°. The road gradually descends over a series of rounded hills, covered with mixed hard and soft wood forest trees. A small deposit of bog iron ore occurs on the right hand side of the road.

11th, $2\frac{1}{3}$ P. M., Forks of Kennebec, Burnham's tavern, barometer h. 29.264, T. 82°, t. 27° cent.

When we had completed our measurements, I was called to examine a ledge of rocks one hundred rods east of Burnham's hotel, belonging to Charles B. Foster, Esq. This ledge has for a long time furnished the people with whet-stones and owing to the fineness of the grit, it answers very well for that purpose. On examining the rock, however, we found that it effervesced freely with acids, indicating a large proportion of carbonate of lime. The hill is about one hundred feet high—presents an abrupt precipice, composed of alternating strata of buff colored limestone and green calciferous slate. The limestone alternates with the latter rock in strata from half an inch to a foot in thickness, and forms nearly one tenth of the mass of the hill. The strata fall

asunder when broken out, so that there is no difficulty in separating them. Mr. Foster has obtained slabs nine feet square and one foot thick, with great ease.

It was at first supposed, from the effervescence of the rock with acids, that it could be burned for lime; but on making a chemical analysis of it, I found that although it contains lime enough for that purpose, it also contains ingredients that will run into glass at a white heat, and hence foresaw that it could not be readily made into lime. The most calcareous portions, if carefully burned, will slake into a brown lime; but I should not recommend it to be used for that purpose, since it is so much more valuable for another article, which I have discovered could be easily made of it.

Immediately after my return to Boston, I made the following analysis of this stone.

Analysis, of 100 grains:

Silica, - - - - -	27.0
Alumina, - - - - -	8.4
Magnesia, - - - - -	9.0
Carb. iron, - - - - -	2.8
Ox. iron and manganese, -	2.4
Carbonate lime, - - -	50.0
	99.6

When burned at a red heat, it does not slag, but beyond this temperature, runs into a dark green glass. Burned at red heat, it does not slake with water, but when ground to powder, makes with sand a cement that hardens under water. By mixing fifteen per cent. of clay and ten of manganese, the cement becomes fully equal to the hydraulic cement imported from England, which sells at from six to eight dollars per cask, in Boston. This substance is now in such universal demand for making water proof canal locks, dams, culverts, cisterns, cellars and aqueducts, that it cannot fail to become a most important discovery to the people of Maine, to find so good a cement in the State.

Having in my last annual Report, predicted the occurrence of roofing slate near the north line of Moscow, such having

been the direction of the Barnard and Piscataquis slate as to cause it to strike the Kennebec river near that point, I inquired during the present survey whether any such slates had been found, and was informed that they occured on the western side of the river, near that point. I was also shown several good writing slates that had been obtained there. Subsequently I sent two assistants to explore that locality more minutely than we could have done without abandoning our section, and they report that they find an abundance of good roofing slate upon the estate of Moses D. Townsend, Esq., near the north part of No. 1, 2d Range, and that the strata run N. 30° E., S. 30° W. and dip N. W. 80°. Since quarries have not been opened, it was difficult to ascertain how large sheets could be obtained; but they are of opinion, that the slates could be easily split out from three to six feet square. The land being high, the drainage is easily effected to the requisite depth for working quarries.

On the estate of Mr. Joseph Young, good roofing slate is also found, and one was obtained having upon it the impression of a fern. The surface of the slate at the last mentioned locality, is stated to be a little stained by oxide of iron, but it may be only superficial. The hill of slate is eight hundred feet high, so that drainage is easily effected. The course of the strata is N. 30° E. and S. 30° W., and dip N. W. 80°. From the above data, it will appear that the disruption of the Kennebec slate is in a different line from that on the Piscataquis, which runs nearly E. and W., but it probably belongs to the same formation.

Slates also occur in Bingham, four miles east of the village, and the assistant reports that they are intersected by quartz veins, so that the strata break out in pyramidal blocks, one foot wide at the top and six feet at the bottom. There is one place where slates may be split off ten feet square, and six or eight inches thick, and grave stones may be made of it, but it is said not to answer for roofing. The course of the strata is N. E., S. W., dip 80° N. W., and the hill fifty or sixty feet high. This locality is on the estate of Mr. Seldon of Norridgewock.

Visited the Saw Mills, half a mile above Bingham, where there exists a bed of blue limestone, containing small veins of galena, or sulphuret of lead, and blende, or sulphuret of zinc. The rock also contains an abundance of massive pyrites, or sulphuret of iron. The limestone strata run N. 50° E., S. 50° W., dip N. W. 60°, and are cut by numerous veins of quartz. Returning to Bingham, I took a meridian altitude of the sun, and calculated the latitude of Bingham to be N. 45° 01^m 10^s.

Mr. L. G. Fletcher, of Bingham, and several other gentlemen, contributed their aid in the promotion of our work, and to Mr. Fletcher I am indebted for some valuable statistics on the subject of maple sugar, which will be presented in this Report.

Concord, on the west side of the Kennebec river, opposite Bingham, was partially examined at this time, and subsequently we revisited it, while engaged on that side of the river. The Old Bluff on the borders of the Kennebec, in this town, is a precipitous hill of pyritiferous mica slate, so highly charged with pyrites as to form by natural decomposition, considerable quantities of copperas and oxide of iron. This hill, measured by the sextant, is three hundred and fifty feet high above the river's level. It is composed of compacted strata, which run N. 30° E., S. 30° W., and dip 70° or 80° N. W. Having examined its base, we ascended to its summit, from which there is a charming view of the Kennebec, with its green islands, surrounding hills, valleys and plains, covered with a luxuriant vegetation. The pretty village of Bingham, with its gaily painted houses and small gothic church, are seen below, on the opposite side of the river. On the north, Old Moxa Mountain rears itself in the distance, and a range of mountains stretch towards the south as far as the eye can reach. Having obtained specimens of all the rocks of Old Bluff, we returned to Bingham.

14th July, we set out for Solon, examining on our route some enormous blocks of mica slate, containing staurotides and macles. Visited Caritunk Falls, seven and a half miles

below Bingham, and half a mile from Solon village, where the Kennebec dashes over hard quartz rock and mica slate ledges, which run N. E., S. W., and dip N. W. 60°. Measured barometrically the fall, which is sixteen feet perpendicular; but is said sometimes to be upwards of twenty feet. The gorge through which the waters pass is fifty feet wide.

View of Caritunk Falls.

ANSON is situated upon the borders of Seven Mile Brook, in latitude 44° 47^m 40^s north, by our observations. This town is quite distinguished for its agricultural enterprize and success in raising wheat, having actually produced more than is reported from any other town in the State. The amount set down in the wheat bounty returns to the Legislature, is 12,713 bushels; but Mr. Bryant, the town treasurer, informs me that the actual quantity raised was much greater, 400 bushels having been reported to the treasurer of New-Portland—200 bushels more was not reported, and he estimates that at least 500 bushels was raised on which no bounty was claimed. In order, then, to estimate the fertility of the soil, we have to add 1,100 to the returns, making in all 13,813 bushels. Calculating on the returns to the Legislature, and upon the number of acres of land upon which the crops were raised, we shall have 16¼ bushels as the average yield per acre.

1837	Acres.	Seed planted.	Crop raised.
	789	1,387	12,713 reported. 1,100 not reported. 13,813 Total.
1836	Acres.	Seed planted.	Crop raised.
	unknown.	unknown.	8,196 bushels.

The above table will serve as a model for similar records, and the remarks on the mode of cultivation, manures, &c. could be inserted below, or in an additional side column. The name of the farmer ought also to be inserted against each crop which he reports. It is highly desirable that the State should establish agricultural societies, and employ some person to obtain the statistics of agriculture; for we could then easily learn the products of the various soils which are submitted to my analytical researches, and the facts would then become of greater value and of universal interest.

On the estate of Beza Bryant, Esq., very large crops of excellent wheat have been raised, and the yield has been forty bushels to the acre. I examined several of his fields, one of which produced a very fine crop of wheat last year, and was then laid down to herd's grass and clover, and which is very luxuriant and is estimated to yield at least two tons of hay to the acre. Another field, covered with a very fine crop of wheat, which, on the 14th July, was four feet three inches high, and in good condition. It was planted on the 11th of April, and sprung up in three weeks after planting, even though the ground had been frozen after the seed were planted. Owing to the forwardness of this wheat, it escaped the attacks of the weavel, and is also free from smut.

Barn yard manure has been used for a dressing, and the soil which is highly charged with carbonate of lime, according to my analysis. It effervesces freely with acids, shewing that the lime is combined with carbonic acid.

100 grains of soil from Mr. Bryant's wheat fields contain, after being dried at 300°:

Insoluble silica,	- -	75 grs.
Soluble matter,	- -	25 "
		100

100 grains of the soil contain:

Water,	- - - - - -	7.6
Geine, (vegetable matter,)	- -	5.6
Ox. iron,	- - - - - -	6.1
Carbonate lime,	- - - -	4.6
Silicious matter,	- - - -	75.0
		98.9

In the meadows there are several deposits of bog iron ore, in quantities insufficient to supply a furnace. Yellow ochre abounds, and may be used for yellow or red paint. There are also several shallow peat bogs, which may be rendered available to the farmer for making compost manure.

The rocks in Anson, on Seven Mile Brook, are hard flinty slate, and are of little practical interest. They produce a considerable fall of water on the stream, which is available for mill privileges, and is in part used for that purpose.

16th July. Re-visiting Norridgewock, I had an opportunity of obtaining some information relating to the soils and their produce, which could not have been learned on my former visit.

The estate of Dr. Bates, on the south side Kennebec, one mile from the river, there is an extensive plain, which that gentleman has cultivated for nine years, breaking up about fifteen acres per annum. The soil is a yellow loam on the surface, and below it there is a sandy soil, beneath which, after passing through coarse gravel, we come to quicksand at the depth of eight feet, where there is a regular stratum of clay, serving to retain the water, so that wells sunk to that depth never fail. The soil was this year planted with wheat, oats and peas together, and potatoes. The wheat was forward in its growth, but had suffered materially from the Hessian fly and weavel, while some of it was quite smutty.

Dr. Bates is of opinion that the smut is principally from the suckers, and results from the destruction of the main

stock, by a worm. Many examples taken in his field, seemed to verify this opinion—and on splitting open some yellow smutty stalks, we found small oval shaped larvæ of some insect, probably that of a fly. There appear to be two generations of these insects, according to the opinion of Dr. Bates. I took three specimens of this soil to examine—first, from the uncultivated plain—second, from the oats and peas—third, from the wheat field.

The following statistical observations have since been handed me by Dr. Bates:

"The field planted with peas and oats, yielded on eight acres, three hundred bushels—or 37½ bushels to the acre. The wheat field produced about seventeen bushels of wheat to the acre, and was much injured by the fly."

Analysis of the soils will be found in the agricultural section of this Report.

Returning to Augusta, we set out on an excursion to certain localities which had not been examined, on the eastern side of the Kennebec. The rocks which crop out on that side of the river, from Augusta to Dresden, are entirely of the primitive class—such as gneiss, with granite beds and veins, and mica slate.

Dresden, level of the Eastern river, near Mr. S. Alley's house, July 31st, barometer h. 30.000, T. 82°. The soil on the western side of the neck of land is sandy; while on its eastern side it is a clay loam, which near the stream is luxuriant in crops of grass and grain. Mr. Alley informed me that the average crop of wheat raised on this loam, is about fifteen bushels to the acre. No rocks crop out near this place, but farther on the road to Wiscasset, a granite ledge appears, the surface of which is water worn and scratched with diluvial marks, running N. 15° W., S. 15° E. I have since learned that beds of limestone are found near East River, which I have not yet examined.

Alna. On the estate of David Lowell, the soil appears to be good, and bears a grove of young maple and beech trees, there being about five acres of soil covered with them. A

specimen of this soil was taken for chemical analysis. (See Agricultural Geology.)

WISCASSET, near Turner's hotel, 31st July, 7 P. M., barometer 29.950, T. 71° F. Aug. 1st, 9¾ A. M., barometer 29.930, T. 68° F. Examined the rocks in the vicinity of the town, which are composed of gneiss with granite veins. The strata of the gneiss dip nearly vertically. Diluvial marks run N. 10° E., S. 10° W. Wiscasset is a very beautiful village, situate upon the Sheepscot river, and remarkable for its deep and beautiful bay, which is open to navigation throughout the year. It affords an admirable situation for a naval depot, and has been surveyed by the United States Government for that purpose. The lofty rocks which flank the bay, offer every facility for successful defence from an attack by sea; while its secure harbor could contain a large maritime force. Situated so favorably, the town enjoys great commercial advantages, and a rapidly reviving trade manifests a spirit of industry and enterprise worthy of great praise. The first whale ship from Maine, sailed from this port, and thus far the business has proved lucrative to the owners of the ship. A large jaw of the spermaceti whale laid upon the wharf, and the owners kindly promised to send it as a specimen to the State Cabinet, it being the first trophy of the kind won by the whaling enterprise of the State. Large steam saw-mills are in operation in this town, and immense numbers of sugar boxes are sawed by machinery, and packed in shooks for the West India market.

Aug. 2d, 11¼ A. M., Alna, head of tide, barometer 30.200, T. 72°, air t. 74° F. Damariscotta Mills, level of sea, 4 P. M., level of high water, barometer 30.217, T. 78° F. In company with Mr. Bryant, and several other gentlemen of Damariscotta, visited a remarkable deposit of oyster shells, on the west side of the river, upon the estate of Messrs. Samuel and Joseph Glidden, in the town of Newcastle. This locality is two miles from the Mills, and between that place and the Bridge village. The bed of oyster shells forms a cliff, which is, at its highest point, twenty-five feet above the sea level, and it slopes down to about six feet above high water mark, and extends

one hundred and eight rods in length, and from eighty to one hundred rods in width. The shells are disposed in regular layers, and are very perfectly preserved, being whitened by the action of the weather; but where they are most exposed to the action of frost, they have been crumbled into a fine shell marl.

Various conjectures have been formed as to the origin of this deposit, and the general belief is, that the shells were heaped up there by the ancient Indian tribes who formerly frequented the spot. Their regular stratiform position, and the perfection of the shells, appear to oppose this theory, as also the rarity of living oysters in the neighboring waters. They are, however, of comparatively recent deposition, for they evidently rest on diluvial soil. It is said also that arrow heads, bone stilettoes and human bones, have been found in the bed of shells, near the surface; but a more careful examination should be made before the question is decided; and this will probably be done ere long, since the value of this deposit for enriching the land has been explained to the neighboring farmers.

From our measurements, it will appear that there are no less than 44,906,400 cubic feet of shells in this bed; and since they are generally of large size, they may be easily burned, and will make about ten million casks of lime. Hence it will appear that this bank may be drawn upon quite extensively without exhaustion, while the lime is a most valuable article for the improvement of soils. It will be easy also to grind the shells to fine powder, in mills—an operation which will answer better for agricultural purposes, since the amendment will remain more permanently in the soil. Good mill sites may be obtained, and if the shells are reduced to fine powder and packed in casks, it might be advantageously exported to other places for sale.

Near Damariscotta Mills there is a small island, composed of gneiss rocks, covered with a yellow loam mixed with fragments of oyster shells. It is called Tappan's Island, and is interesting as being an ancient burial place of the Monhegan Indians, whose skeletons are frequently exhumed by exca-

vating the soil to the depth of from eighteen inches to two feet. This tribe of Indians appears to have long since become extinct, and no burials have taken place on the Island for nearly two hundred years—yet the bones which have been dug up are quite perfect. Dr. C. Ellis, who accompanied us, discovered and dug up in my presence, a nearly entire skeleton, which was found with the knees drawn up and the face turned eastward, or towards the rising sun, indicating a belief in the resurrection; and it is stated that this position was the uniform method of burying the dead, as shewn by the examinations which have been made upon this Island. Some of the skeletons, I was informed by Mr. Bryant, have sheets of copper placed over their heads, shewing that they were probably buried since the Europeans came to these shores. A copper knife blade, set in a bone handle, was also found.

Returning to the main land, we visited Bristol and Bremen and Pemmaquid Point, that section having been necessarily omitted in our exploration of the sea coast, on a former occasion. At the extremity of Pemmaquid Point, which is a long rocky promontory, there are some remarkable geological phenomena. The rocks are generally gneiss and mica slate, the strata running N. 43° E., S. 43° W., while the dip is N. W., or southeast, according to the lines of disruption and fracture produced by the upturning of strata, which was effected by huge beds and veins of granite rocks.

At the extreme point, below the light-house, may be seen a remarkable instance of this violent intrusion of a granite vein, the strata of mica slate having been turned completely over by the injected vein. Here we remark the contortions of the mica slate, and the curve where it was bent over by the upheaving and overturning vein of granite. The vein is from twelve to thirty feet wide, and runs N. 30° E., S. 30° W. On its eastern side, the strata of mica slate dip S. E. 60°, and on its western side N. W. 60°. Huge masses of the protruding granite have been broken off, and have been removed from thirty to fifty yards to the westward. One of these blocks measures eighteen feet square—another

twenty-five feet long by eight feet wide—the former being thirty yards and the latter fifty yards from the parent vein.

Walking two or three miles to the northward, along the rocky ledges which form the eastern side of this promontory, we observed that the rocks consist of regular strata of mica slate, which is divided by huge beds of coarse white granite, with lateral veins from three to ten feet wide, striking across the strata in a N. W., S. E. direction. The mica slate is curled and broken from this disruption, shewing that it was rendered plastic by the heat of the intruded beds and veins.

The granite is made up chiefly of large crystals of white felspar, with a little grey mica and quartz, and is unfit for architectural purposes. The regularly stratified mica slate would answer for flagging stones, if quarries could be easily opened and wrought.

Five miles northwest from the light-house, near Pemmaquid landing, on the estate of Mr. William McCobb, we examined a deposit of bog iron ore, which exists in the state called pan ore. It covers an area of about half an acre of land, and is five feet thick. The ore is solid, and is coated with yellow ochre.

It contains, according to my analysis:

Water of composition, - -	22
Per oxide of iron, - - -	63
Insoluble silica, - - -	15
	100

During the roasting of this ore, a very faint trace of arsenial odor was perceived, but the quantity is evidently too small to injure the ore for making cast, although it might be injurious to the bar iron. The quantity of ore is insufficient to supply a blast furnace; but it may be worth the labor of digging for exportation to iron works elsewhere on the coast.

Bristol. In this town there is a dyke of well characterized basalt, containing olivine and basaltic hornblende in grains and crystals. This dyke is found on the estate of Mr. Joshua House, in the north part of the town, near a granite

quarry, and two miles from Damariscotta River. It runs N. 60° W., S. 60° E., and shews itself again on the southeast side of Biscay Pond. The basalt is columnar in its structure, the columns striking horizontally from the wall rock, which is granite—the width of the dyke varying from twelve to thirty feet. This being the first instance where we have discovered well characterized basalt in Maine, a large number of the columns were obtained for specimens.

The granite quarry, on the eastern side of the road, has been wrought to small extent, but the rock is of good quality, and splits well into the usual forms required.

Waldoborough. Visiting Waldoborough, we examined two important granite quarries, one of which is three quarters of a mile north, and the other half a mile northeast of the village. Feyler's quarry is a hill of granite, which by measurement, was found to be one hundred and thirty-six feet perpendicular altitude above the sea level. The openings which have been made, disclose the rock for the distance of one hundred yards. Blocks may be obtained eight feet in thickness, and thirty or forty feet long. The granite is a vein in mica slate, and runs N. 80° W., S. 80° E., cutting across the strata of mica slate, which run at the south extremity of the quarry N. W., S. E. The slope of the granite ledge is N. W. 10°.

The Ludwig quarry, three quarters of a mile north from the village, on a hill 144 feet above the level of high water at Waldoborough, has been wrought to some extent, openings having been made thirty-six yards square, and blocks of granite split out. The stone is a fine grained and light colored granite, composed of small crystaline grains of white felspar and white quartz, with specks of black mica interspersed. The largest blocks which may be obtained, are twenty feet long and five feet square, but common sized ashler stones are readily split out into the shape desired. It is a very handsome building stone, appearing at a distance like white marble. A beautiful cut obelisk, shewing its quality and appearance, may be seen in the burial ground of the village.

WARREN. This town is remarkable for its numerous and extensive quarries of white crystaline limestone, which are wrought for lime and for marble; the sound blocks of fine grain being selected for the latter purpose.

The principal quarries which have been opened, belong to the different members of the Starrett family, who have for a long time been engaged in quarrying and burning of limestone. The first quarry which I visited, belonged to Alexander Starrett, and is situated on the western side of the St. George river. There are two distinct beds on this estate, included between strata of gneiss and mica slate, the largest is 20 feet wide and runs N. 75° E. S. 75° W. and dips to the East 70°. The rock is of that variety called magnesian limestone, is largely crystaline, and contains disseminated in it numerous crystals of galena or lead ore, and blend of sulphuret of zinc.

There are numerous deep natural caverns, opened by excavating the rock, which appear as if produced by the action of water on the limestone.

Owing to the quantity of soil resting on this quarry, it is said to be more economical to bring the stone from the eastern side of the river, where it is more readily obtained close to its shore. At the quarry of David Starrett, this transportation is effected upon the ice during winter.

On the eastern side of the St. George, we examined the quarry of Mr. A. Starrett, where a bed of coarse white crystaline limestone is contained between strata of mica slate, the direction of the walls being N. N. E., S. S. W., and dip 61° E. S. E. This bed is ninety-nine feet wide, and is uncovered to the length of 150 feet.

John Starrett's quarry is a similar bed, but is 122 feet wide, and 300 feet long, where it has been opened. The including strata run N. 43½° E., S. 43½° W., and dip S. E. 55°.

Benjamin Starrett's quarry presents a similar limestone bed, 30 feet wide, and running in N. E. S. W. direction, with its dip to the S. E. 43°. Another bed occurs to the S. E. which has not been wrought.

Half a mile N. W. from A. Starretts, we came to David Starrett's quarry, which is important on account of its situation and the facility of working, since it is on the banks of the St. George, and forms an abrupt cliff, where it is easy to blast out the stone, while the drainage is complete. The cliff is 26 feet high, and is composed of white limestone, spotted and veined with blue colors.

The limestone bed runs N. 10° E., S. 10° W., dips to the eastward 80°, and may be traced one quarter of a mile towards the farm-house.

The lime made at Warren is generally carried to Thomaston for sale, by means of gondolas, upon the St. George stream, the distance being six or seven miles.

The price of wood is 1 dollar and 25 cents to 1 dollar and 50 cents per cord, and the lime sold last year from 95 cents to 1 dollar per cask.

For the purpose of making a continuous measured sectional view of the country, I proceeded to Thomaston, and examined all the limestone quarries for which that town is distinguished, taking the altitude of the various points above sea level. I was also desirous of making a minute examination of the remarkable soils of that vicinity, and collecting specimens of those which it was deemed necessary to analyze. The results which have been obtained, will be included in that section of the present Report, which is devoted to Agricultural Geology. I shall, however, state here, that the great mass of soil which lies upon the surface of the limestone at Thomaston, is evidently diluvial and alluvial, principally of the former class, and that it was derived from the decomposition and disintegration of granite, gneiss and mica rocks which lie to the northward of that town.

This fact accounts for the almost entire absence of carbonate of lime in the soil, and indicates at once to the farmer, that liming is there extensively required. The use of muscle bed mud has already been introduced with happy results, and its use depends upon these principles: First, a diluvial granitic soil is too permeable to water to retain well the requisite water and aliment for plants. Secondly, the soil

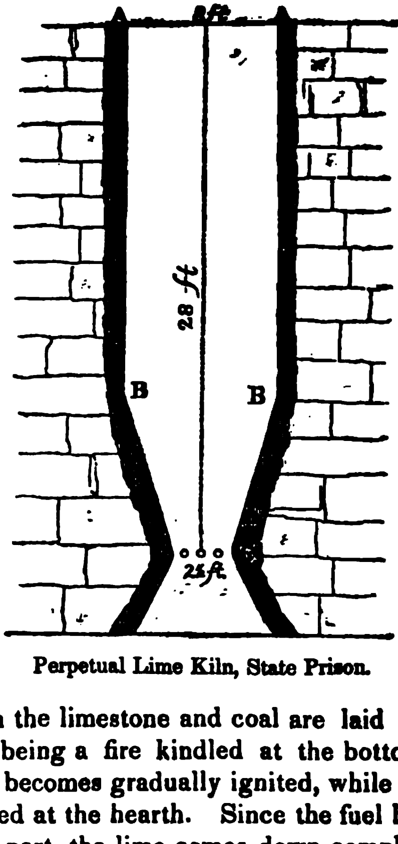
needs lime; and muscle beds are full of the comminuted fragments of shells, which are composed of that substance. Where the soil is alluvial, it is generally very fine and does not need clay; and there, air slaked lime, which may be obtained cheaply from the refuse lime of the kilns, will answer admirably—giving to the soil the elements which it requires.

Near the marsh quarries, there is a large bog of peat, which I have described in a former Report, and which I now mention for the purpose of reminding the farmers that it may be made into a most valuable compost with lime and a small quantity of any animal manure.

The lime trade of Thomaston, has suffered from the general stagnation of business, during the past year, and but little lime would have been sold, had it not been for the new demand which has just arisen among agriculturalists in the other States, owing to the discovery made by their geological surveyors and chemists, that nearly all the soils on the sea coast from Virginia to Maine are wanting in calcareous matter. Thomaston and Camden being the most accessible ports, where a supply of this indispensable requisite to skilful farming may be obtained, it is evident that with the spreading of knowledge on this subject, will their trade revive and far exceed its usual prosperity; for the demand created by agriculture will be immensely greater than that, for architectural purposes. The introduction of the perpetual kiln, which was recommended for trial in my first Annual Report, has proved successful, and it is found that with refuse anthracite coal skreenings, lime may be burnt at a much lower rate than by the use of wood fuel. Thus the manufacturer can now afford to sell his lime at a much lower rate than formerly, and still maintain the same profit on his labor. There are now three perpetual kilns in Thomaston; one at the State Prison and two at the Shore Village, all of which have been and still are in successful operation.

The following measurements were made, of the dimensions of the State Prison kiln, which has a cylindrical body, and is contracted to an inverted cone at the bottom.

It is 8 feet wide at the top and through the body internally,
28 feet deep from top to hearth,
And 2½ feet in diameter inside at the hearth.



Perpetual Lime Kiln, State Prison.

In this kiln the limestone and coal are laid in alternating layers, there being a fire kindled at the bottom, the whole mass of coal becomes gradually ignited, while the ingress of air is regulated at the hearth. Since the fuel burns out first at the lowest part, the lime comes down completely burned, and cold enough to handle, so that is immediately packed in casks, while new rock and coal are continually supplied above, as the charge is removed at the hearth. The latter operation is effected by withdrawing the iron bars at *o*, when the lime falls out gradually, it being supported by the Boshes B, B. The price of coal was stated to me to be $3.50 per ton, and their lime sells, packed handsomely in legal sized

casks, at seventy-five cents per cask. Some lime of poorer quality, has been sold as low as sixty-five cents per cask.

The above prices are much below the actual cost of burning lime, by means of wood at $3.00 per cord, as may be seen in the statistics of my former reports; hence the perpetual kiln must eventually be adopted, since the price of wood upon the sea coast will be constantly rising. Perhaps there may be contrived some more economical methods of burning lime with wood fuel, and I formerly suggested the trial of a perpetual kiln for the purpose. If it can be so managed that the wood may be burned in separate arches, then all the ashes resulting may be saved, and will prove valuable for making potash, while the spent ashes resulting, will make an excellent dressing for the soils of Thomaston. Provided the flues of the arches communicate directly with the boshes of the kiln, the temperature produced will be amply sufficient for the burning of lime, since it only requires a full red heat of sufficient duration to penetrate the stone entirely.

In the burning of lime, there has been some difficulty in effecting a thorough and uniform calcination, without melting some of the rock, and this has been owing principally to the fact that the stone is purchased from different quarries, and used indiscriminately, while it is well known that one variety of limestone will bear more heat than another, and hence the most fusible pieces were melted into slag, if the heat was driven too far, and if not far enough then the purer rock was not thoroughly burnt, but had a core inside. This difficulty might be easily remedied by burning one kind of stone, and thus learning how high a temperature it would bear. By noting the degree of heat which each kind of limestone required, it would be easy for an intelligent workman to regulate his kilns so as to meet with uniform success.

There are several different varieties of limestone in the State Prison quarries which burn at different temperatures, and make lime of different qualities. The upper layers are striped with brown and white colors, and the brown streaks derive their colour from the presence of the carbonate of iron,

ation and specimens for the institutions, provided for by law, since our first exploration of these localities. I also collected specimens of the soils for analysis, whenever it was thought the information would prove useful to the farmers of Thomaston.

One of the most luxuriant fields of wheat which I examined, belonged to Mr. Lincoln Levensaler, who informed me that he had dressed the soil with muscle mud, and also twelve loads of stable manure to the acre. For two years past, he had raised potatoes upon it, and this year had sown it with tea wheat, two bushels to the acre. The measure of land sown was two and a half acres. The seed came from Union, and was planted the latter part of May. The crop looked extremely heavy, and since it was an example of a well cultivated soil, I took a specimen of it for analysis. (See Agricultural Geology.)

Specimens of soils were also obtained from the woods and from uncultivated fields in various parts of the town.

At Beech-wood quarries, it will be remarked that the strata of talcose slate rock, which include the limestone, dip to the N. W.; while south of Tollman's Pond, they dip to the S. E. Proceeding towards Camden, a mile from the latter place, the strata dip again to the N. W. Thus it appears that the stratified rocks of this town have been subject to various upturnings, and the appearances of the limestone shew the same effect.

On the Old Turnpike to Camden, we travel over talcose and plumbaginous and mica slate. A few diluvial scratches are seen on the recently exposed strata, and those measured run N. 5° E., S. 5° W., by the compass. In Lincolnville, there are extensive beds of good limestone, which were described in a former Report. Nine and a half miles from Belfast, we examined a hill of granite which projects through the surrounding slate rocks, but found the stone unfit for architecture.

Belfast. Latitude, by observation ,44° 26^{m} 7^{s} N. Variation of compass, 13° W. This town presents but few geological peculiarities, which have not been already

scribed. It is founded upon that variety of argillaceous slate which is impregnated with plumbago, and is hence called plumbaginous slate. The strata of this rock have been remarkably disturbed by the upheaving forces which acted during the period of the eruption of granite. The rock forms by its decomposition a blue soil, full of small particles or scales of the slate. But the soil resting on its surface, is all of foreign origin, it being diluvial deposition, having been swept to its present resting place from the north.

From Belfast I travelled up the Penobscot, and crossed the ferry at Bucksport, it being my intention to examine the eastern side of the river, and to collect specimens of interesting soils and minerals.

Bucksport, situated on the eastern side of the Penobscot, is a most important point for the defence of Bangor, in case of war with any maritime power.

Having been informed that bog iron ore was found on the farm of Mr. Abner Kimball, near the north line of Orland, I subsequently examined the locality, but describe it here for the sake of order. This bog iron is a deposit of eighteen inches in thickness, resting upon a stratum of blue silicious clay. The ore is of good quality, and is in the form of pan and lump ore.

The composition of it is as follows, according to my analysis of 100 grains:

Water,	- - -	17.8
Insoluble,	- - -	4.0 silica.
Per Ox. iron,	- -	78.2=Iron, 54 per ct.
		100.0

The quantity of ore is not sufficiently great to support a furnace, there being only an area of two rods square covered with it. It may, however, be worth the labor of digging, for transportation to some other place, where a furnace may be erected to work other ores.

The soil around the bog iron of Bucksport is charged with yellow ochre, and there is a strong chalybeate spring pouring

its waters into the meadow in which the bog ore is constantly, but slowly collecting. From this ore red paint may be readily made, by heating it to redness in contact with the air, and then separating by washing and subsidence of the fine particles from water.

From Bucksport to Orrington, we pass over agillaceous slate rocks, dipping to the S. E., with valleys here and there filled with tertiary clay deposits. Next we come to strata of gneiss, dipping to the N. W. and veins of granite cutting through it, or included between the strata. On this route, we saw luxuriant fields of wheat, growing upon the clay loam of Orrington and Brewer. One of the most thrifty fields in the latter town, belonging to Mr. Thomas Barstow, attracted my attention from the uncommonly good condition of the grain; and on inquiry, I learned that the soil had been limed to some extent. The tertiary clay itself contains from five to ten per cent. of lime, and hence its fertility in crops of wheat.

EDDINGTON. Passing through this town, some interesting geological features were observed. The rocks are ledges of argillaceous slate, which is not fissile but stratified; running N. 50° E., S. 50° W., and dipping N. W. from 60 to 70°. On the surface of the rocks and in the soil, there occur boulders of conglomerate rock, or grauwacke, which I recognized as being identical with that variety which composes Peaked and Sugar Loaf Mountains, upon the Seboois river; and I have no doubt that they were brought down from those mountains, by a current of water and ice, that swept over the country in former times from north to south.

Having been informed that bog iron ore existed in the town of Argyle, and, as it was supposed, in considerable quantities, I visited that town and made the necessary examinations.

The locality in question is one and a half miles north from the house of Mr. Solomon Comstock, on a swampy tract of land granted to Waterville College, and near the Hemlock stream.

The bog iron ore, where it shews itself on the road through the swamp, is ten inches in thickness, and rests on a pan of blue clay. It is of good quality, but the quantity is too small to support a furnace, there being but a few square rods of ground containing it.

From the analysis which I have made of the specimens handed to me last year by Mr. James Childes, it appears that the ore yields,

Water, - - - -	22	
Vegetable matter, - - -	6	
Insoluble silica, - - -	12	
Per. ox. iron, - - -	59	=41 pr. cent. iron.
	99	

Hoping that a larger deposit might be discovered, I requested Mr. Samuel Ramsdale, of Bangor, to accompany Mr. Childes, in a more extensive search of the neighboring bogs, but he informs me that he was unsuccessful.

Returning to Bangor, I made an excursion to the Pushaw Lake, where slate quarries were said to have been opened. On the farm of John Quanlan, openings had been made in two places, which disclosed the strata, which run N. 60° E., and dip N. W. 70°. The slates are not of good quality for roofing, since they split badly and are unsound.

Leaving Bangor, I travelled to Sebec, for the purpose of examining the soils, and exploring the extent and value of the Piscataquis slates. The road through Levant to Charleston, passes over one of those curious diluvial embankments called horsebacks, which extends four miles in a northern direction, coinciding exactly with that of the diluvial scratches which abound on the rocks. On each side, there are swamps filled with peat, and these low lands were doubtless ancient lakes, that have since been drained.

On the road to Foxcroft, we find huge blocks of granite, resting upon the ledges of argillaceous slate, while the surface of the latter rock is deeply cut with diluvial marks, which run N. 30° W., S. 30° E., the strata of the slate running N. 85° W., S. 85° E., and dipping S. 75°. The blocks

of granite and the rounded boulders, appear to have been transported from the granite mountains, which are on the north side of Sebec Pond, for no such rock is in place between this locality and the lake.

Dover and Foxcroft, on the opposite sides of the Piscataquis river, are important and flourishing villages, both distinguished for agricultural and manufacturing enterprise. The soil is of excellent quality, bearing heavy crops of wheat and other grain, while their waterfalls drive a number of mills, which saw boards, grind wheat, and make kerseys.

In Dover, there are several valuable beds of bog iron ore of excellent quality, and I therefore spent several days in exploring their extent and in measuring the quantity, which could be depended upon to supply a furnace. On the land of Mr. Ashur Hinds, No. 4, 11th Range, three quarters of a mile south from Foxcroft Mills, and near the road, there occurs a considerable deposit of solid pan iron ore, which is from eighteen inches to two feet in thickness. It extends to the distance of 1102 feet in length.

```
                        726  "  "  width.
                       ----
                       6612
                      2204
                     7714
                     ------
                   2)800052  square feet area.
                     400026
                     ------
      Cubic feet,  1,200,078
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This ore is composed, according to my analysis, of, in 100 grains:

Water,	- -	20.
Silica,	- -	4.
Per Ox. iron,	-	73.=50.5 per cent. iron.
		97
		3 loss vegetable matter?
		100.

A cubic foot of the ore will weigh about ninety-four pounds, and allowing one million cubic feet, there will be ninety-four million pounds of ore—which yielding fifty per cent., will give forty-seven million pounds of iron—or 23,500 tons. Hence this bed will furnish an ample supply to a furnace for many years.

Should this supply be deemed inadequate to warrant the erection of a blast furnace, we are enabled to point out another more extensive bed close at hand, upon the estate of Mr. Robert Rogers, of Dover, two miles west from Foxcroft Falls. This deposit occurs in a swamp, seventy rods in length and thirty-two in width, nearly the whole surface being composed of bog iron ore, covered here and there with a layer of black oxide of manganese. I traversed this swamp in several directions, and found the ore at nearly every point where we dug. It is at least two feet in thickness, but the water running into the holes while we were cutting through the pan, prevented our measuring it to a greater depth.

Allowing for length	1155	feet.
	524	" for width.
	4620	
	2310	
	5775	
	605220	feet area.
	2	" thick.
	1,210,440	cubic feet of ore.

A specimen analyzed, contains :

Water, - -	13.
Silica, - -	46.
Per Ox. iron, -	33.5—or 22.8 per cent. iron.
Manganese, -	7.5
	100.0

The compact ore is much richer.

The bog manganese, which also occurs in very large quantities, is a valuable article for bleaching by means of chlorine which it disengages from muriatic acid, and will hereafter

be required by cotton factories upon the Piscataquis. It may be used to prepare the gas, which may be employed directly, or the chlorine may be combined with lime, so as to form bleaching powder. Manganese is also a useful ingredient in making hydraulic cement, and is wanted for the manufacture of that cement from the hydraulic limestone of the Forks of the Kennebec, and of Starbord Creek, Machias.

On the farm of Mr. Robbins, in Foxcroft, one mile north of the village, there is also a small deposit of bog iron ore; which is, however, mixed with fragments of slate rock, cemented into a solid mass. The ore is however dry, and is only of importance as a contribution towards the supply of a furnace.

The bog ores of Dover will make good cast iron, and admirable water power may be obtained upon the Foxcroft and Dover Falls, for the erection of furnaces. The price of wood is from one to one dollar and twenty-five cents per cord, and charcoal now sells for eight cents per bushel, but could be made on a large scale for six cents.

Limestone required for a flux, abounds at and around the Falls.

The following is an analysis of the limestone found in large quantities on the south side of the Piscataquis, at Dover.

Slate, - - - - - -	25.4
Ox. iron, - - - - - -	4.0
Carbonate lime, - - -	70.6
	100.0

This rock is suitable for a flux for iron ores, and is also capable of being converted into good lime, for agricultural purposes. It is, however, too brown colored for plastering ceilings.

The slate of Foxcroft is of great value, on account of its extent, the goodness of the article, and the facilities for opening quarries. The most important locality is on the farm of Mr. Benjamin Leavitt, where the slate forms a hill seventy feet high above the immediate plain. The rock is

perfectly sound, free from any impurities, and splits to the proper thickness required for making roofing and writing slates. It is soft enough for the latter purpose, and is wrought to small extent, for the supply of common school slates. The strata of this ledge run N. 80° E., S. 80° W., and dip to the south 85°. Slates, of suitable sizes for every demand, are easily split off, and wrought into the proper forms. The extent of slate measured by us was on the brow of the hill, in length 660 feet.

330	" width of good slate.
19800	
1980	
217800	
70	deep.
15,246,000	cubic feet of slate in the hill.
30	slates to a foot, allowing waste 10.
2)455,380,000	" one foot square.
228,690,000	slates, two feet square, in the hill

measured. Or, we may allow, nearly a million tons of slate can be obtained from this locality.

The cost of working and transportation, as I was informed by the best authorities in the town :

Four men in one day will quarry and trim one ton of roofing slate, at $1 per day, - - - -	4
Transportation to Bangor, 35 miles, at $6 per ton,	6
Cost at Bangor, - - - - -	$10
Freight to Boston market, - - - - -	3
Cost of slate in Boston, - - - -	$13

To this we must add the interest on the cost of the quarry, tools and stock, and the wearing and loss of tools used. These items cannot of course at present be ascertained, bu they will not amount to much. The slate quarries of Mai

are numerous and valuable, offering ample inducements to enterprise, and will ere long be successfully wrought for the supply of the Atlantic coast.

There are many other quarries described in my former Reports, viz. at Williamsburgh, Brownville and Barnard, besides those upon the Kennebec, above Bingham and Concord.

The following valuable statistics have been furnished through the politeness of Capt. Isaac Gage, of Augusta, who has recently visited the slate quarries of Wales.

AUGUSTA, January 1st, 1839.

Dr. CHARLES T. JACKSON,

Dear Sir :—Having during a recent visit to England, had an opportunity of examining the Penrhyn slate quarries near Bangor in Wales, I take the liberty of giving to you some of the information obtained, and the observations I have made upon them, and which, if they can be of any use to you, in illustrating the advantages to be derived from the valuable quarries in the State of Maine, and thereby induce enterprising capitalists to turn their attention to the working of them, will confer immense benefits upon the community,—reducing of the premiums of insurance, consequent upon their general use, and avoiding of those destructive fires, which so often in a night destroy the accumulations of years of industry, I shall be amply repaid. They are situated on the north coast of Wales, at the entrance of the Straits of Menai, about seven miles from the ancient town of Bangor, and at a considerable elevation from the water. They are of great extent, and are opened into the sides of the mountain amphitheatrically, and mostly open to the weather. There are about ten galleries, with breasts of about twenty feet high, which in working are always carried back upon their levels, and as nearly simultaneously as possible. Upon each of these galleries or levels, moveable iron railways are laid for the transportation upon cars of the slate rock and the waste, as it is quarried, and the rails are connected with an inclined railway, terminating at Port Penrhyn, from which the shipments are made. There are said to be employed in the quarries about 2000 men and boys, in quarrying and preparing the slates—besides those employed in transporting them to the port. There is also upon the estate, a mill for the manufacture of writing slates, monu-

ents, tombstones, chimney jambs, mantle peices, tanks, pavements, &c. &c., making in all probably not less than 2500 persons employed in giving value to a material, which in its native bed is of but little or no value; besides the employment of tonnage in transporting it to almost all parts of the world. There are generally from twenty to thirty vessels, in the shipping season, waiting for cargoes. The production of the quarries is estimated at about 200 tons per day, through the year; they are the property of a Mr. Pennant, a gentleman of the highest estimation, who devotes the large income derived from them, in improving their productiveness, and in ornamenting his estates. He has converted the half savage and turbulent Welch mountaineer into the peaceable and quiet laborer and agriculturist, and spread comfort and happiness over his wide domain; and from the ready market, afforded at the quarries, for its agricultural products, the soil has been converted into a perfect garden. The net annual income from these quarries is said to be on an average of £70,000 sterling: or $336,000. The slates are sold, delivered upon the wharf, at Port Penrhyn—the imperials or largest size, at 50s. per ton, equal to $12.00; and the next smaller sizes, of an equal quality, and in equal quantities of each, at an average of about $10.00. The other inferior sized roofing slates, which are more generally used, are sold by the thousand of twelve hundred, and weigh per thousand from 66 cwt. to 13 cwt., and varying in size from 24 by 12 inches to 11 by 5¾ inches—the first five and best sizes averaging $10 per ton; and the next four sizes, which are not often exported, $5.50. To these prices, are to be added the shipping charges, freight, insurance, commission, &c. &c., altogether amounting to quite one half the above largest sum—to say nothing of the breakage—and to all of which must be added the merchant's and dealer's profits; so it may be quite safely calculated, that slates cannot be ever imported into the United States, (when the duty of nearly twenty-five per cent. is added,) and sold for less than twenty-five dollars per ton. These quarries are probably better situated for shipping to the United States, than any other in Europe; and upon viewing the subject, in all its bearings, one cannot but come to the conclusion, that if the working of some of the slate quarries in Maine were commenced, upon a scale commensurate with their importance, and the great and increasing demand for the article, and conducted with ordinary skill and economy, that from them

the whole coast of America, and much of the interior, especially of New-England, would be supplied; and it could hardly fail of paying to the proprietors large and permanent dividends, and leave them with a property constantly increasing in value.

The people employed in quarrying and preparing the slate, are generally paid by the piece, or receive the price of a certain proportion of the current value of the articles prepared—consequently their emoluments depend upon their industry. From their appearance, I should think they were better paid, fed and clothed, than the operatives in the manufacturing districts in England, with the exception of the workers in iron, who, as you are aware, generally receive higher wages than most other laborers.

I remain, respectfully,
Your ob't serv't,
ISAAC GAGE.

Dover Falls measured near the Kersey Factory of the Piscataquis Manufacturing Company, have a perpendicular fall of 20 feet 9 inches. In the factory there are manufactured some of the strongest and best kerseys, and they are mostly drab colored.

Opposite the factory on the borders of the stream, there is a large cavern 25 feet in depth, which the action of water and ice has excavated in the slate rocks. The slate is filled with veins of calcareous spar, and is itself higly calciferous. The rock is stratified, and the strata run nearly E. and W., and dip 85° S.

Foxcroft Falls have a perpendicular pitch from the dam, of 14 feet. Upon these falls there is an extensive mill for purifying, grinding and bolting wheat for flour, the mill having besides an excellent winnowing apparatus, and three sets of stones for grinding. They belong to Mr. J. Bradbury, who informed me, that in the months of January, February and March last, that he ground in this mill no less than 6000 bushels of wheat, besides large quantities of other grain, and in 9 months he received the value of $1000 in tolls. I mention the above facts, to show the amount of grain produced and consumed, in this immediate vicinity.

The rocks at the falls are calciferous slate, filled with veins

of calcareous spar, and the obstruction caused by their outcropping edges produces the falls on the river. Beside the above mentioned water privileges, there is another good site, upon which a furnace ought to be erected for smelting the iron ore. It is upon the Eastern side of the stream in Dover, and there a water power of 14 or 15 feet fall, may be readily obtained for the purpose.

Another locality of roofing slate has been discovered upon the estate of Mr. Amos Morse, 6 miles N. E. by E., from the village of Sebec. The strata of slate run N. 80° E., S. 80° W., and dip to the north.

Since quarries have not been opened, it was difficult for me to judge so well of the workable quality of the slate, but it appears to be of good quality, and the slabs which we removed split very well.

Another locality of slate is found near the Sebec Pond, one hundred rods from the town line; but since no excavations have fairly exposed it, Mr. Morse thought it would be impossible for me to gain any satisfactory information by visiting it, as the outcropping edges do not shew its quality. The latter locality has been sold to Mr. E. Smith, of Bangor.

From the high land of Foxcroft, we have a view of a remarkable mountain in Elliotsville, called the Borestone Mountain. It bears so striking a resemblance to the form of Mt. Vesuvius, in Naples, that I made the following sketch of its outlines.

Borestone Mountain, Elliotsville, bearing N. N. W. from Leavett's Slate quarry in Foxcroft.

I was enabled to obtain some agricultural statistics, in Dover, from several farmers, and present the following facts:

On the land of Nathaniel M. Stephens, one acre of land, planted with two bushels of bald wheat, gave him a product of thirty bushels. He thinks that the bald wheat does best on ploughed land, and the bearded wheat on burnt land.

Mr. William S. Mayhew planted one and three quarters acres of land with two and a half bushels of bearded wheat, and raised forty bushels.

The above data shew that the soil of Dover is luxuriant, and capable of producing heavy crops of grain; and it is evident that the occurrence of carbonate of lime, as one of its components, is the cause of its remarkable fertility.

Guilford. On the estate of Mr. Joseph Kelsey, two acres of land were planted with six bushels of oats, and sixty bushels to the acre were raised. No manure was used, but the soil was broken up the year previous and planted with potatoes.

The same farmer also planted five acres of land with nine bushels of wheat, and raised one hundred bushels—or twenty bushels to the acre. The Hessian fly and weavel damaged the crop, or it would have been much larger.

His field on the opposite side of the road, was last year treated with plaster of Paris, as a top dressing; and on half an acre of the land, he planted one bushel of wheat, the produce of which was thirty bushels. From this fact it will appear that gypsum exerts a beneficial influence on soils containing a very little lime distributed in clay loam.

The rocks of Guilford are argillaceous slate, with beds of limestone of a blue color. The strata run N. 88° E., S. 88° W., and dip south 80°—the limestone occurring in alternating strata with the slate rocks, in layers which separate when the rock is struck with the hammer. It may be burned for agricultural and ordinary use. It occurs on the river's banks in inexhaustible quantities, near a little island in the stream, while there are now a sufficiency of loose blocks in the bed of the stream to make several kilns of lime. There are also thin strata of limestone one hundred rods north of the meeting house. The limestone on the river, analysed, is found to be composed, in 100 grains, of

Insoluble slate, - - - -	13.8
Per Oxide of iron, - - - -	1.4
Carbonate of lime, - - -	84.8
	100.0

From the above analysis, it is evidently a strong and good limestone, and may be profitably burned, since wood costs but seventy-five cents a cord, and the expense of transporting lime from the sea coast is so high as to forbid its use in agriculture.

The following estimate will shew the cost of burning 100 casks of lime:

Labor and blasting the rock, 10 cents per cask,	$10.00
Wood, ten cords at 75 cents, - - -	7.50
Attendance on kiln, two men four days, -	8.00
Per 100 casks in bulk, - - -	$25.50
One hundred casks at 20 cents, - - -	20.00
Cost of 100 casks of lime, - -	$45.50

Or 45 cents per cask, packed.

The refuse slabs from the saw-mill on the stream, may also be advantageously used in burning the lime, and they cost but fifty cents per cord.

Guilford Falls are also the sites of several manufacturing establishments, there being carding, clothing, shingle, clapboard and saw mills, besides a tannery. The fall of water is about six feet perpendicular pitch. Boulders of grauwacke with terebratulæ three feet in diameter, of diluvial deposition, occur in the river.

Elliotsville, twenty miles north of Guilford, furnishes a solid and good slate for the manufacture of tombstones; and Mr. Thompson, of Guilford, has an establishment where they are wrought extensively. At his shop, I saw slabs of this stone from four to five feet wide, and eight feet long, but engagements on another section prevented my visiting the quarry.

Travelling from Guilford to Parkman, we noted a great number of diluvial scratches upon the surface of the slate rocks. The grooves run N. 5° W., S. 5° E., while the strata run nearly east and west. The same direction in the grooves was also observed to be constant on the road to Dexter, excepting on the high lands, where they run N. 15° W., S. 15° E.

Dexter is a pretty village, situated on the eastern head branch of the Sebasticook stream, and is distinguished for its manufacturing and agricultural enterprise. On the river there are a number of manufacturing establishments. The Kersey factory, when in full operation, employs sixty-seven persons, thirty-five of whom are females. It has 1050 spindles in spinning jacks, and twenty-four power looms. At the time when I visited it, but eight looms were in operation, and but seventeen persons employed. This establishment belongs to Messrs. Cutler, Farrar & Co. An extensive tannery and several mills, are also situated upon the stream.

Near the factory there is a deposit of ochreous yellow oxide of iron, that is continually deposited by a strongly charged chalybeate spring, which comes out in the meadow. It is too small in quantity to be used for other purposes than

for paint, while the mineral spring is a good tonic medicine, useful in some disorders of the digestive functions.

While at Dexter, Mr. Simeon Safford shewed me some specimens of lead ore, which had been found upon the estate of Mr. Charles Jennings, near the south line of the town; and accompanied by him and several gentlemen of Dexter, I visited and examined the locality. The ore was discovered accidentally, in digging a well in slate rock charged with veins of quartz. On examination, it was found that the ore occurred in one of the veins of quartz, associated with iron pyrites, ochreous oxide of iron, black blende or sulphuret of zinc, and sulphuret of copper and iron. The vein at the top of the well is but eight or nine inches wide, and it widens in descending twelve feet to the width of two feet. The ore contained in the vein is from one to three inches wide, and is quite irregular. It runs N. 70° W., S. 70° E., and dips 40 or 50° to the southwest, following all the irregularities of the quartz vein. Associated with the ore, there occurs an abundance of green talc, which is very soft and flaky when first obtained, but hardens on exposure to the air. On examining the slate strata which form the wall rock in the well, they were found to be much contorted, shewing great disturbance at the epoch of their elevation. The general dip is to the south, but could not be measured owing to the contortions.

From the evidence which I was able to obtain, it would appear that a similar vein of lead ore runs through Corinna, and comes out near the house of Mr. John Bigelow, two and a half miles south, or at Mr. James Couland's, six miles and a half southeast from Mr. Bigelow's.

Having obtained all the information which I could on the spot, I cut out a number of specimens from the vein, and subjected them to chemical examination by cupellation, for the purpose of ascertaining whether any silver was contained in the galena. Five grains of it cupelled before the blow pipe, gave a very distinct globule of silver, which by estimation, was equal to $\frac{1}{100}$ the weight of the ore. This is, then, a very rich argentiferous galena, and if larger veins should be dis-

covered, might be profitably wrought for silver, the lead being at the same time converted into litharge. It is not worth the labor to work the present small veins, but I would request those who reside in the vicinity to examine every vein that may in future be discovered; for there may perhaps be one of sufficient width to work profitably, since every 500 pounds of the ore will give a pound of pure silver. I would not, however, advise sinking shafts into the rock, for such researches would prove expensive—it being only necessary to be attentive to those excavations, which may be made for other purposes—such as cellars and wells, sunk down to the rock, excavations on roads, &c. If the ore is found, it will be discovered in the quartz veins, associated with yellow ochre and blende.

Another discovery which we were able to make, will prove of great value to all the citizens of Dexter. It is the existence of immense beds of good limestone in that town. On the estate of Mr. Crowell, there is a very extensive bed of good limestone, which is of a blue color and occurs in regular strata running N. 85° E., S. 85° W., and dip S. 80°. This locality is favorably situated for working, and the stone, on chemical analysis of 100 grains, gives the following results:

Insoluble slaty particles, - - -	8.6
Oxide of iron, - - - - -	1.4
Carbonate of lime, - - - -	90.0
	100.0

It bears a full red heat, and makes a very good and strong lime, which slakes well, and will answer for all ordinary purposes.

We found also another important locality, upon the estate of Mr. Fish, where the limestone is of a blue color, with veins of calcareous spar, and is imbedded or inter-stratified with calciferous slate. By chemical analysis, I find it to be composed, in 100 grains of the blue rock, as follows:

Insoluble slaty particles, - -	9.6
Oxide of iron, - - - -	1.2
Carbonate of lime, - - -	89.2
	100.0

This is also a good limestone, and will burn like that just described.

Another bed of limestone occurs on the farm of Mr. L. Pullen. It is a blue compact limestone, inter-stratified with the strata of slate. By chemical analysis, I find it to be composed of

Slate, - - - - -	20.0
Oxide iron, - - - -	1.8
Carbonate lime, - - -	78.2
	100.0

This is not quite so rich as the former varieties, but still burns well and makes a light brown lime, that slakes nearly white.

On the farm of Mr. John Puffer, there also occurs a similar limestone, composed of

Slate, - - - - -	14.4
Ox. iron, - - - - -	1.6
Carb. lime, - - - -	84.0
	100.0

Estimate of the cost of burning 300 casks of lime, at Dexter:

Labor in blasting and breaking the rock, 10 cents per cask, - - - - - -	\$30.00
Thirty cords of wood, at 80 cents, - -	24.00
Attendance on kiln—packing and discharging the kiln included—three men five days, at 1.00,	15.00
Cost of 300 casks of lime, in bulk,	\$69.00
Three hundred lime casks, at 20 cents, -	60.00
Cost of 300 casks of packed lime,	\$129.00
Or for one hundred casks, - - -	\$43.00—

which is 43 cents per cask—or in bulk, 23 cents per cask for lime.

If but one hundred casks are burned at a time, the cost of lime in bulk, will be 26 cts., or 46 cts. in the cask. Thomaston lime, at Dexter, costs two dollars per cask, and a considerable proportion of the lime is sifted out through the staves, by transportation over land from Bangor. It is evident, then, that it is far cheaper for the people to burn the lime which they require from their own rocks, than to depend upon a supply from distant places; and it would be altogether impracticable there, to afford the use of Thomaston lime for agricultural purposes, since so large a quantity is needed.

I obtained some agricultural information in Dexter, which is here recorded.

On the farm of Mr. Benjamin Green, three acres of land, ploughed and dressed with barn yard manure, was planted with four and a half bushels of wheat, or one and a half bushels to the acre—the seed having first been steeped in a solution of blue vitriol, containing one ounce to the quart of water, and then dried by rolling the seed in slaked lime. Crop raised, forty bushels to the acre, last year. Supposes that he shall obtain but twenty-five bushels to the acre, this season. He thinks that lime decidedly prevents smut in wheat, but is doubtful as to the effect of blue vitriol. He tried a field with wheat rolled in lime, and wheat not so treated; and the former was destitute of smut, while the latter was troubled with it. (For analysis of soils, see the Agricultural section.)

Dr. Burleigh informs me that there is an extensive granite quarry near the S. W. corner of Ripley and N. W. corner of St. Albans. It forms a mountain mass, and is easily quarried for the supply of the neighboring towns, but it is too remote from navigable waters for distant transportation.

Corinna. Passing through this town, I remarked that an abundance of erratic blocks of granite, rounded masses of grauwacke, with fossil shell impressions, occured in the soil, while the ledges are uniformly composed of argillaceous

slate. The soil appears to be good, sugar maple, yellow birch and ash trees being abundant and thrifty.

SKOWHEGAN. Returning to this place, I collected some additional specimens of limestone, and learned some interesting facts respecting the tertiary clay, which there contains remains of marine shells. They have been found at Mr. Philbrook's pottery, 30 feet above the river's level.

They also occur in Vassalboro', and were discovered in digging a well near the house of Capt. Wm. Reed, in that town, being 50 feet above the Kennebec River, and 29 feet below the surface of the earth. These are probably the highest limits of the ancient tertiary sea, which does not appear to have covered the State of Maine, more than to the depth of 150 feet beyond the present tide waters rise.

Returning to Augusta I met the assistants who had been sent to explore the Androscoggin section, which I afterwards reviewed with them, and continued a measured section to the Megalloway River.

Returning to Portland after repairing my barometer, I again compared the instrument, with the stationary one kept by Mr. Solomon Adams, of Portland, and then set out on the sectional tour, through that great tract of country watered by the Androscoggin River.

Sept. 11th. The surveys which I proposed to make on this section, were to measure the rise and fall of the land, the distances from the several points, and the situation of the great rock formations, as we crossed them at the northwesternmost corner of the State. At the same time we collected all the minerals, fossils, specimens of rocks and soils, required for a full illustration of the subject.

From Portland we went to Westbrook, where there is a very interesting deposit of fossil shells, several of which belong to extinct species. They characterize the lower tertiary clay of Maine, and in a scientific point of view, throw great light upon the ancient history of the earth. The draftsman was directed to make a sketch of the locality, while we collected the specimens required, and measured the height of the spot. The locality in question is the slide of

the Presumpscot, a little north of Pride's bridge, in Westbrook. This bank of clay and soil slid down into the river, and so obstructed its course as to turn it back upon itself, while the water was stopped off from below. At length, the waters burst the barrier, and after sweeping off several acres of an adjoining field, made for itself a new channel. Owing to the manner in which the slide took place, the clay is thrown up in curious winrows, and the small trees, which formerly stood perpendicularly upon it, were inclined towards the river at a considerable angle.

In the clay we found a great abundance of ancient marine shells, the most abundant species being one described by Professor Hitchcock, under the name of the nucula portlandca, and another species of that genus, described by Dr. Gould. Besides the above, there occur an infinity of corbulas, mactras, sanguinularios, and clams or mya mercinarina and mya dehiscens. Also the bucklers and claws of crabs.

WINDHAM. In this town, near the bridge, I found an abundance of mica slate rocks, filled with large crystals of staurotide, also large detached blocks of granite, containing a rare mineral called spodumene, it being one of the minerals containing the new and fixed alcali, lithia. Crystals of garnet also abound.

A mass of cyanite is said to have been found in this town, but we could not learn where it occurred, and there was none in any of the rocks *in place*. The rocks from Portland to this place, are first talcose slate, then mica slate and granite gneiss—and they all dip to the southeast.

RAYMOND, on the borders of Sebago Lake, was our first stopping place for the first day's route. Here we proposed examining an iron mine of some note, and to explore the vicinity for other useful minerals. In the evening, I took astronomical measurements for the latitude and variation of compass. By two observations of N. and S. stars, the latitude of Raymond is N. 43° 57^{m} 26^{s}.

Specimens of magnetic iron ore, from Davis' Hill, in Raymond, having been sent to me for analysis, I was desirous of

ning the locality where it was found, for the purpose
ertaining whether a sufficient quantity of the ore could
ained to render it of economical value. At my request,
l gentlemen of Raymond accompanied me to the spot,
is a mountain situated in the northeast part of Ray-
, six miles from Sebago Lake and three quarters of a
northwest from the head of Great Rattle Snake Pond.
and belongs to Messrs. John and Valentine Davis, who
nade some exertions to ascertain the value of the ore,
heerfully aided me in my examination of the locality.
ill is an abruptly precipitous mass of rocks, covered
a scanty soil, bearing a few small forest trees, and
s an elevation of 371 feet above the level of Rattle
Pond. The rock which contains the iron ore, is a
bed of green epidote rock, containing also many scat-
crystals of black hornblende, and the iron ore occurs
ets or veins, closely implanted, measuring from one to
nches in thickness. They are closely attached to the
and were evidently formed at the same time with it,
they are so intimately blended. Owing to this close
ment, it is difficult to extract the ore without quarrying
rge portions of the matrix, which in working should be
n off, so as not to encumber the furnace with useless
r.

re is evidently a sufficient quantity of the iron ore in
nountain to supply a blast furnace, but it will cost
labor to extract it from the rock. I would not, how-
abandon the locality, without making a trial of the
ity of picked ore, which a laborer can blast out and
for the furnace in a day; for if it should prove that
an can earn fair wages at the work, as many hands can
ployed as might be required—for there is ample room
e face of the cliff for all the laborers that might be
sary, since the bed is nine rods wide, and exposes the
re along its whole breadth. By chemical examination,
ears that the ore will yield, when free from the rocky
, seventy per cent. of iron, and I should think that,
l as clean as might be required, it would give about

18th Sept., 7 A. M., barometer 29.710, T. [illegible]° F., at Harris' tavern. Set out for Paris Hill, passing over the little Androscoggin in the South village, where there is a cotton factory and flour mill, the machinery of which is moved by the waters of the stream, and arrived on Paris Hill in season to take a meridional altitude of the sun, preparatory to the observations of the solar eclipse. 18th Sept., noon—barometer 29.210, T. 72° F. Latitude, by meridional altitude [illegible] sun, 44° 7^m 59^s. Having carefully adjusted the K[illegible] circle, I watched for the moment of the first contact of the solar and lunar discs, the watch being regulated to Portland mean time.

The moment of first contact was 3 h. 28^m 30^s, by watch. At 3 h. 32^m 50^s, sun's lower limb, apparent altitude 25° [illegible]. 3 h. 54^m 50^s, sun's upper limb, apparent altitude 22° 45^m [illegible]. 4 h. 14^m 14^s, sun's upper limb, apparent altitude 20°. [illegible]

Mean of times, 3 h. 31^m $32^s.5$. Mean of the altitudes [illegible] lower limb, 25° 53^m 15^s.

Time calculated from the above observations was, P. [illegible] 3 h. 37^m 28^s, for apparent time—and for mean time, 3 h. [illegible] $31^s.58$.

Watch, -	3 h. 31^m $32^s.50$
Mean time,	3 31 31 58
	0 h. 00^m $00^s.92$ difference—watch fast.

Time by watch regulated to Portland mean time—

P. M.	3 h. 28^m 30^s,	first contact lunar and solar discs.			
"	3 30 15	appar. alt. sun's lower limb,	26° 6^m 30^s.		*Bar. 29.1[illegible]
"	3 32 50	" " " "	25 40 00		Ther. 21°[illegible]
	3 h. 31^m $32^s.5$	mean of times.	25° 53^m 15^s	mean of altitudes of sun's lower limb.	

Apparent altitude sun's upper limb—

P. M. 3 h. 54^m 50^s, -	22° 45^m 30^s.	Bar. 29.130, T. 69° F., t. 19°[illegible]	
" 4 h. 14^m 14^s, -	20 00 00 .	" 29.120, T. 68° F., t. 19°[illegible]	
4 h. 04^m 32^s,	21° 27^m 45^s	mean of alts. sun's lower limb.	

* Time calculated from apparent altitude sun's lower limb.

Apparent time,	3 h. 37m 28s.	
Equation of time,	5 46 .42	
	3 h. 31m 31s.58	mean time at Paris.
Watch,	3 31 32 .50	
	0 h. 00m 00s.92	watch too fast.

Time of first contact of sun and moon's discs at Portland, as observed by Messrs. Senter and Adams, - - - - 3 h. 28m 28s.90
Observed by me at Paris, - - - - 3 28 29 .03

Later, - - - 0 h. 00m 00s.13

Leaving Paris, we travelled through Woodstock to Rumford, passing over a very hilly road, from which many magnificent views of mountains, lakes and streams, may be seen. As we descend from Paris Hill, we come to a small stream, on which there is a saw-mill. At the level with its waters, the barometer stood, Sept. 20th, 11¼ A. M. 29.87, T. 65°. Ascending from this point to the summit of a high hill, over which the road crosses, barometer stood 29.351, T. 69° F. Rise of the hill from the stream, 560 feet. From this eminence a number of beautiful sketches were made by Mr. Devereux. Paris Hill is seen to the southeast, nearly on a level with this place. Above it, to the eastward, is Streaked Mountain, and farther to the left, the mountains of Hebron. Speckled Mountain, in Peru, presents its lofty and abrupt escarpment to the N. N. E. Indeed, the whole landscape to the eastward, is truly magnificent, composed of heaving masses of lofty mountains of granite, with thickly wooded valleys, and here and there scattering houses relieve the wildness of the scene. The maple and birch trees had put on their gay red and yellow foliage, giving a most picturesque effect to the whole view.

Woodstock is wholly underlaid with granitic rocks, rising into large rounded mountains. On the hill, at noon, barometer 29.154, T. 68° F. Hence this point is 184 feet above Paris Hill. The granite rocks are here marked with diluvial furrows, running N. 20° W. Several trap dykes cut through the granite, and run N. 37° E., S. 37° W. They are from one to two feet wide. But few interesting minerals were found on this route. Plumbago occurs in the gneiss and

mica slate, resting on the flanks of the granite mountains, and here and there a little limestone presented itself, imbedded in similar rocks.

RUMFORD, 20th Sept. 6¼ P. M. At the hotel, near the bridge, barometer 29.610, T. 58° F. In the evening, took meridional altitudes of north and south stars, for the purpose of obtaining the latitude of the place. North star, (Polaris) at 10 h. 31^m 30^s; apparent altitude 45° 44^m; bears N. [illegible] 30^m E. Variation 11° W. Latitude, by calculation, 44° 30^m 10^s N. Alpha Aquilæ at meridian, apparent altitude 53° 59^m. Latitude calculated—44° 29^m 45^s N.

44°	30^m	10^s	by Polaris.
44	29	45	" A. Aquilæ.
2)88	59	55	

N.44° 29^m $57^s.5$ mean lat. of Rumford (Wardwell's) hotel.

Between Rumford and Woodstock, there are high ridges of land a mile or more long, called Whalebacks, and appear to be diluvial embankments of granitic soil.

On the estate of Mr. David Holt, in Woodstock, there is a hill composed of granite and mica slate rocks, and large masses of plumbago are scattered through the latter, [illegible] They are, however, very difficult to extract, and hence are of but little value. The granite rides over the mica slate on the southwest side of the hill, and the plumbago is found at the point of contact of the granite and mica slate, in veins and nodules from one to three inches wide, and from three to six inches thick. Near the house, there occurs a little [illegible] limestone, not pure enough for burning.

A hill of granite, to the south of this place, presents lofty cliffs, attaining a perpendicular elevation of three hundred feet above the immediate base.

The soil in the valley, is of a dark brownish color, and is of good quality, bearing a native forest of fine rock maple trees. It is evident that the disintegration of the neighbouring limestone, contained in the rocks, has enriched the soil with lime, and hence its fertility.

From the maple forest, Mr. Alonso Holt has obtained, during the past spring, about three hundred pounds of good sugar, besides a considerable quantity of molasses. He tapped about 200 hundred trees, and says that a barrel of sap yields seven or eight pounds of sugar.

The Paint Mine, as it is called, demanded our attention, and accompanied by several intelligent and public spirited citizens of Rumford, we visited it, to examine its nature and extent. The locality in question, is upon the estate of Mr. Samuel Luffkins, three miles north of the village of Rumford. It is on a hill-side, where a mineral spring, issuing from the rocks, has deposited a conical heap of the ochreous red oxide of iron, amid a clump of trees. The paint is capable of being wrought advantageously for the manufacture of red ochre, since the quantity is large, and it is constantly forming by gradual deposition from the water of the spring. It may be rendered of a very bright red, simply by the process of roasting it—and then it may be rendered fine by levigation with water, or by sifting.

Since it was evident that a deposit of oxide of iron had been taking place here for ages, I thought it probable that a sufficiency of bog iron ore might have collected in the lowlands around, and on exploration I found such a bed, the least dimensions of which are as follows:

Length 450—width 90 feet—depth 2 feet:

$$450 \times 90 \times 2 = 81,000 \text{ cubic feet.}$$

A cubic foot of this ore will weigh 99 pounds:

$$81,000 \times 99 = 8,019,000 \text{ pounds.}$$

And it yields 50 per cent. of iron:

$$8,019,000 = 4,009,500 \text{ pounds.}$$

Or about 2,004 tons of iron, and would supply a small blast furnace about ten years, allowing that it was worked six months in the year. Other deposits of similar ore, will be discovered in the vicinity—when large works may be set up. Charcoal may be obtained in any quantity desired for six cents per bushel.

The composition of the Rumford bog iron ore, by my analysis, is as follows:

Water,	- -	15.5
Vegetable matter,		6.5
Silex,	- -	3.0
Per. Ox. iron,	-	75.0=pure iron, 51.97 per ct.
		100.0

It will yield fifty per cent. of iron, in the blast furnance, and will smelt easily, making good cast iron. Other ores of iron are said to occur in the neighboring mountains, but we were not fortunate enough to discover them. Bog ores do occur in the adjoining towns, as will be seen in the sequel.

Rumford is a very picturesque spot, surrounded by rugged granite mountains, amid which the beautiful Androscoggin winds its devious way. The bridge which crosses this river is similar to some of those which occur in the old states of Europe, and although not of the best style of architecture, still gives a pleasing effect to the landscape. The following sketch, furnished by Mr. Devereux, will give an idea of that place.

View of Rumford Bridge, Androscoggin River.

Rumford Falls are produced by the bounding waters of the Great Androscoggin, as they sportively leap over abrupt and craggy ledges of granite rocks, and dash their spray high in air. This spot presents some most picturesque scenery, and many facts of scientific importance.

There are at present three or four water falls at this place, while anciently there must have been others of greater magnitude, for deep holes are seen worn high up on the rocky banks, where the waters never ran in modern times. Now the whole descent is divided into two principal and two minor falls—the first two being from six to ten feet—the middle, seventy feet perpendicular—and the fourth, twenty feet; while the whole pitch is estimated at 180 feet. It is the middle fall, however, that will attract the attention of the traveller, for there the torrent of water pouring down with the noise of thunder, and dashing itself into foam as it chafes the rocky walls, produces an effect full of grandeur.

From below this cataract, our draftsmen obtained the following sketch, which is here represented by a small wood cut.

Rumford Falls, Androscoggin River.

To the geologist and mineralogist, this locality will also prove instructive, for there are many curious, beautiful and useful minerals, found in the rocks.

On a point just below the great falls, there is a bed of granular limestone, which was examined by my assistants, on a former occasion, but which still afforded me additional information. This bed is of a coarse granular or

crystaline variety of carbonate of lime, containing scattered green crystals of actynolite and pargasite, in small grains and fibres. The limestone is included between strata of mica slate rocks, which are greatly contorted by the power of the up-thrown granite, which cuts through its mass. Thus it will be seen that the granite veins have torn off masses of the limestone and mica slate, and swept them up to higher places than they originally occupied, while the disturbed appearance of the strata themselves evince most clearly the action of an injected igneous rock. A variety of crystallized silicates of various kinds, are found in the poorer limestone beds; and observing their resemblance to similar productions of the Phipsburg limestone, I searched and found a number of those rare minerals which I had formerly discovered at the latter locality. Yellow garnet, massive and crystallized—egeran—pyroxene, of several species and varieties—such as the sahlite, augite and pargasite. Phosphate of lime, of the variety called asparagus stone, &c. occur, with a few scattered crystals of scapolite. Limestone is, however, the most important substance which occurs, and there is a sufficiency to supply the demand which may arise for many years. Some of the beds are ten feet in thickness, excluding the interfoliated masses of rock which they contain. I should estimate the quantity of lime that may be obtained here at 100,000 casks, and it is easy to quarry and burn. In order to bring it to land, it will be needful to make an inclined plane of timber, like those used in saw-mills, and the machinery of the saw-mill immediately above will drag the rock to the bank where it is to be burned. Wood is cheap and abundant, but refuse slabs of the mill are the cheapest and best fuel for the burning of lime.

Estimate of cost of 100 casks of lime:

Quarrying and hauling to bank, 15 cts. per cask,	$15,00
Breaking rock, packing and discharging kiln, 10 cts,	10,00
Three days attendance on kiln, two men, - -	6,00
Ten cords of wood, at 75 cts. - - - -	7,50
Cost of lime, 100 casks in bulk,	$38,50

One hundred casks, at 20 cents, - - - - 20.00

Cost of 100 casks of lime packed, $58.50

or 38½ cents per cask in bulk—58½ cents per cask, packed.

The result will not vary much from this estimate. Place against it the present price of lime at Rumford, and it will be seen how great a saving may be made by burning this limestone.

I beg leave also to remark that the rock is very pure, and makes strong lime of good quality, but at the same time observe that some of it will burn fine, or crumble in the fire. By chemical analysis, I find this limestone to contain, in 100 parts:

Insoluble green crystals, - -	20.8
Oxide of iron, - - - -	1.2
Carbonate of lime, - - -	78.0
	100.0

Burns fine in part, but slakes quickly and makes a strong white mortar of good quality.

ANDOVER. This little village is seated on an elevated table land valley, amid an amphitheatre of high mountains, which skirt the horizon all around. It is a good agricultural district, and the people are active and enterprising. Several gentlemen of the village kindly aided us in the examination of the rocks and minerals, and all seemed deeply interested in the work which it was our duty to perform. The latitude of this place had been observed by Capt. Bragg, who found it to be N. 44° 40m 41s; while my observation gave it 44° 40m 39s; which observations agree very nearly with each other. The range of the barometer, &c. intended to measure the height of this place above the sea level, will be seen in the tables at the end of this Report.

While in Andover, assisted by the kindness of several gentlemen, I visited and examined every locality which appeared to be of economical or scientific importance.

One mile north from Virgin's tavern, on the estate of Mr. Holdsworth Newton, and upon the west branch of Ellis river,

there is a small deposit of excellent bog iron ore—too limited, however, to be of value. The bed is but ten or twelve feet square and about a foot thick; 10×10=100 cubic feet.

On the land of Ezekiel Merrill, one and a half miles south-east from the village, there is a larger deposite of similar ore, which exists along the brook side, and is fifty feet long by ten feet wide and eighteen inches thick. It is a solid pan ore, and is underlaid by a white silicious sand, full of nut ore. 50×10=500×1½=750 cubic feet of ore.

While I was engaged in examining the metalliferous deposits, I sent one of the assistants, Mr. Wall, and the draftsman, in company with Capt. Bragg and other gentlemen, to examine and sketch Frye's Falls, in Andover Surplus. These falls exists upon Frye's stream, a tributary of Ellis river, four and a half miles from the village of Andover, and half a mile from the road to township B., upon the left hand or S. W. side of the road. This stream rushes over a precipitous mass of granite gneiss and mica slate rocks, precipitating itself by a fall of twenty-five feet into a rocky basin below. The chasm is fifteen feet wide, and the basin fifty-five feet broad. Here the waters form a beautiful pool, and then leap again by a second fall of twenty feet into another larger and shallower reservoir, from whence they descend gradually to Sawyer's brook, which runs into Ellis river.

One hundred rods above, there is another fall of water, which precipitates itself twenty feet over similar rocks, which stand in vertical strata, running N. E., S. W. This fall also produces similar pools, which are collected in huge granitic basins. Above, is "the Channel," a curious ravine, walled up, as if by artificial masonry, with huge blocks of granite piled one on another. It is fifteen or twenty feet wide, and extends to the distance of fifteen rods in length.

The sketch below, furnished by our accomplished artist, will give some idea of one of the views above described.

Frye's Falls, Andover Surplus.

From Andover, we pursued our course to Umbagog Lake, travelling over a rough road, that crosses a broken hilly country, to township B., at the southern extremity of the Lake. On the road to this place, we ascended a hill and stopped on its summit, at the house of Mr. West, 24th Sept. at noon, the barometer stood at 28.050, T. 10° cent. Height of this spot above the town of Andover, 1036 feet. The country around consists of high mountains and rounded hills of granite, gneiss, and mica slate, covered with a good soil, bearing an abundant growth of sugar maple and beech trees. The mica slate is found, resting on the sides of the granite mountains, and is exposed in numerous places along the road side. It answers very well for hearth stones, and is sometimes used for the construction of forges and chimney backs. From West's hill, we descended towards the Lake, and at the house of Mr. Thomas Bragg, one and a half miles south-east from the head of the Lake, we stopped to make our observations, Sept. 24th, 7 P. M., barometer h. 28.350, t. 6° cent. In the evening, I took astronomical observations, for determining the latitude of the place. By observations upon the North star, it was found to be N. 44° 42^m 39^s; and by Alpha Aquilæ, a southern star, N. 44° 42^m 44^s; Meridional

altitude sun, N. 44° 42m 16s.5; or the mean of the three observations, N. 44°. 42m 30s. Variation of the magnetic needle, 13° west.

Sept. 25th, at Mr. Bragg's, 9½ A. M., barometer 28.684, T. 6° cent. Level of Umbagog Lake, 11½ A. M., barometer h. 29.221, T. 9° cent. Descent from Mr. Bragg's house to the Lake, 433 feet.

Having engaged a large batteau and two boatmen, we set out for the exploration of the Lake, and for our voyage up the Megalloway river. The Umbagog Lake is an irregular shallow sheet of water, with grassy and boggy shores, and is surrounded by lofty mountains of granite, which were clothed with the red and yellow foliage of maple and birch trees, the former greatly predominating and covering the mountains to their very summits. Steering our course northwestward, we sketched a panoramic view of the shores of the Lake, and arriving at the Narrows, stopped to dine, and to take some additional observations.

At noon, 25th Sept., level of Lake, barometer 29.249, T. 55° F., t. air 12° cent. Latitude, by meridional altitude of sun, 44° 49m 20s. Saddleback Mountain, a lofty eminence whose name is descriptive of its outlines, bears, centre, S. 26° W. Angle of elevation from the Lake level, 2° 14m. Speckled Mountain S. 10° W. Angle of elevation, 2° 20m.

Saddleback Mountain, Umbagog Lake.

Umbagog Lake is eleven miles long, and the Narrows are eight miles from the head, or south extremity of the Lake. It is erroneously laid down on all the maps of the State ; but we have been able to obtain a more correct outline from the plan furnished us by Capt. Wilson, and from our own observations. The Lake forms a remarkable reservoir for the supply of the Androscoggin river, and acts as a regulator of its freshets. When the Megalloway rises, it flows into the Androscoggin and raises its waters, so that they run back into the Lake for the distance of two miles, having the appearance of a river running back to its source. The Androscoggin rises from the western side of the Lake, and is a sluggish stream, with low grassy banks, five feet high, covered with scattering swamp maple trees. Its whole aspect reminds us of the appearance of the Moose river, where it flows into Moose Head Lake, and when the river is turned back into the lake by freshets, their similitude would be still more striking. On each side, there is low land which is overflowed by the freshets.

Descending the Androscoggin two miles, we come to its confluence with the Megalloway river, which is here 100 yards wide, and has low banks, covered with a dense growth of swamp maples near its mouth, but farther up the sugar maple, spruce and birch trees abound, and the soil is good. No ledges of rock present themselves on the shores of the river, but high mountains of granite rise abruptly at a short distance back from its shores. Duskin Mountain presents its high and sharp peak in the north.

Arrived at Lombard's landing, we left the boat and walked to his house. 25th Sept., 5 P. M., four feet above level of Megalloway river, at Lombard's landing—barometer h. 29.260, T. 63° F. At Lombard's house, we spent the night, and next morning, 26th, 7 A. M., barometer 29.300, T. 8° cent. Leaving this place, we returned to the river, and taking our boat, ran up the river to Capt. Wilson's, at the first falls upon the stream. The Megalloway is extremely serpentine in its course, winding its way amid high mountains, while its banks are composed of a sandy loam, covered

thickly with maple trees. Large angular masses of granite rocks, which have been hurled from the mountains, are profusely scattered in the soil.

Three miles above Lombard's, by the river, the water becomes more rapid, and is shallow, while its banks are higher. Four miles farther, we come to deeper and more sluggish water, with gravel bottom, and the river's banks are clothed with an abundance of large sugar maples. Stopping at Hibbert's house to dine, I took a meridional altitude of sun, by which the latitude of the spot is ascertained to be 44° 57^{m} 52^{s}.

Noon, 26th Sept., barometer, eight feet above level of river, 29.440, T. 16° cent., or 62° F.

Diamond Mountain bears N. 66° W.; angle of elevation, 9° 29^{m}. Aziscoos Mountain bears N. 46° 30^{m} E.; angle of elevation, 5° 49^{m}.

4½ P. M., 26th. Arrived at Wilson's landing, and eight feet above level of river, barometer 29.400, T. 17½° cent. Walking to the house, which we reached at 5¾ P. M., barometer 29.315, T. 16° cent.

Capt. John M. Wilson has cleared for himself a farm upon this secluded spot, on the borders of the Megalloway, at the falls, and is there constructing a saw mill for the purpose of sawing boards. He is a gentleman of high intelligence, and is more familiar with the topographical features of the surrounding country, than any other person with whom I am acquainted. He states that for four years past more than six million feet of pine timber have been sent down the stream, per annum. The Merrimack Company, winter before last, cut and put into the river no less than five million feet of logs, but last year, only three million feet. The logs were principally cut on No. 4, of the 1st Range. On township A 2, there are saw-mills, where boards and shingles are sawed for the Portland market. Aziscoos Mountain is in No. 5, of the second Range, and is one of the most remarkable peaks seen from this river.

The Megalloway, (according to the experienced hunter on those waters, Mr. Miner Hilliard, of Colebrook, N. H.,) rises

h farther north than has been commonly represented, ie has followed it, in his course around the Camel's Rump intain, and ten or eleven miles farther north than its ces are laid down upon Greenleaf's map, which repres our boundary much too far south of the true line of treaty of 1783. The land to the south of the highls dividing the waters, which form the boundary line, are ed to be much higher than at the present New Hampe corner, and the hills fall off very rapidly towards the th. The rocks are stated to be argillaceous slate, and growth of forest trees to be chiefly sugar maple, birch, ch and spruce.

leing desirous of learning more particularly the nature of t section, and having an opportunity of sending one person Ir. Hilliard's little skiff, I requested one of the assistants o with him, and fully explore the region in question, n Dr. Stephenson at once volunteered his services, and performed that arduous duty in a most satisfactory mer, braving many hardships peculiar to such a cruise. ewith I present the results of his researches, by which it l appear that the opinions of Mr. Hilliard and of Capt. ilson are fully substantiated, while at the same time, we e a vast deal of additional information relating to the logical and topographical features of the country.

t was impossible for me to go farther on this route, iout abandoning engagements, which I had made, to lore other districts; and hence, after supplying Dr. phenson with the necessary camping fare, we turned our teau down stream, and returned to Umbagog Lake.

9th Sept., 2 P. M., four feet above level of Umbagog e, barometer 28.800, T. 17° cent.

October 1st. Returned to Andover, where I took some itional observations and topographical sketches, and then mined all those localities, which the citizens of the town hed me to explore. An account of those which are st important, has already been rendered.

After making such researches as were needful, we set out Rumford Falls, which I have before described, and then

continued our route to Dixfield, crossing a small ford at Swift River, and riding along the banks of the beautiful Androscoggin, we reached the tavern kept by Col. S. Morrill, in Dixfield. 3d October, 7 P. M., barometer 29.584, T. 9° cent.; 4th Oct., 7 A. M., 29.770, T. 4° cent.

The rocks in Dixfield, are wholly of the primary class, such as gneiss and granite rocks. The strata of the former run N. N. E., S. S. W., and dip S. E. 80°.

The latitude of Dixfield, by meridional altitude of sun, N. 44° 32^m 46^s. Variation of magnetic needle, 12° W. 4th, 1 P. M., barometer 29.736, T. 13° cent.

The Sugar Loaves are two remarkable eminences in Dixfield, bearing N.40° E. from the meeting-house, in the village. They were formerly examined by my assistants, and are stated to be composed entirely of granite, deeply worn by diluvial markings.

From Dixfield, we journeyed on to Wilton, where some important observations were made, respecting the geological and agricultural resources of that town and its vicinity. One mile from Holman's hill, we examined a bed of limestone, which is included in mica slate and is cut through by a basaltic dyke, two feet wide, running in a N. W., S. E. direction, and associated with transparent crystals of calcareous spar. The limestone is of good quality, and some of it has been burned for lime.

At Maj. Willard's hotel, in Wilton, 4th Oct., 7 P. M., barometer 29.480, T. 9° cent. 5th Oct., 7 A. M., 29.330, T. 8½° cent.

From the decomposition of neighboring limestone rocks, a small quantity of lime is found disseminated in the soil, and hence it is productive of good crops of wheat. A specimen taken from the field of Mr. McCully, where a crop of forty-eight bushels of wheat had been raised per acre, gave the following results, upon mechanical and chemical analysis:

Pebbles, - -	175
Sand, - -	162
Fine soil,	663
	1000

Chemical analysis, on 100 grains:

Water, - - - - - - - -	5.0
Veg. matter, soluble in an alcaline solution,	12.0
Insoluble vegetable matter, - - -	5.5
Silica, - - - - - - - -	54.2
Alumina, - - - - - - -	10.6
Sub. Phos. alumina, - - - - -	3.0
Per. Ox. iron, - - - - - -	7.0
Manganese, - - - - - - -	1.0
Lime, - - - - - - - -	1.5
	99.8

CARTHAGE. This town possesses some valuable localities limestone, which were fully examined. The most im-rtant beds occur in the south part of the town, a quarter of mile northeast from the Dixfield line, and eight miles west m Wilton, on the estate of Mr. Isaac Reed. An abruptly ecipitous hill, on the northeast side of the Weld road, poses this rock. There are seen two large beds of granular nestone, included in mica slate, running N. E., S. W., and ipping to the N. W. 40°, the strata having been much dis-urbed by the intrusion of a large granite vein, which divides e limestone beds. This hill rises eighty or ninety feet, rpendicular elevation, above its immediate base, and the iff of limestone is sixty-six feet high, with a slope of 30° or irty-two feet perpendicular. The width of the limestone as measured and found to be—southern bed, sixty-seven et—northwestern bed, twenty feet. It extends for a great stance, but the soil concealed it from view, so that I could ot measure its length. Northwest from this locality, there , beside several similar beds, a very large tract of lime-one, belonging to Mr. William Winter, which is eighty feet ide. Descending from the hill to the northwest, we come the farm of Benjamin Winter, where there is a bed of ood limestone, sixty feet wide and of great extent in length.

All the above mentioned limestones are included in mica ate rocks, and are admirably situated for quarrying—the round being high, affords ample drainage, and the rock is

easily blasted out in enormous masses. By chemical analysis, I have ascertained the composition of this limestone to be, in 100 grains:

	Winter's.	Reed's.
Silex, - - - - -	8.8	23.4
Ox. iron, - - -	1.4	0.4
Carbonate of lime, - -	89.8	76.2
	100.0	100.0

It may be advantageously burned for lime.

The following estimate will shew the expenses and profits on the work, in case 100 casks are burned at a time:

Quarrying, 3 cents per cask, - - - -	$3.00
Ten cords of wood, at 75 cts. - - -	7.50
Four days' labor, two men, at 1.00, - -	8.00
Packing and discharging, - - - - -	6.00
For 100 casks of lime, in bulk, -	$24.50
One hundred lime casks at 20 cents, -	20.00
Cost of 100 casks of lime, packed,	$44.50

Or 24½ cents per cask, in bulk—44½ cents per cask, packed.

Thomaston lime costs, at Wilton and Carthage, $2.50.

$2.50 per cask.
44½

$2.05½ clear gain per cask, by burning the Carthage rock.

Since it is clear that this lime will answer for every ordinary purpose, it will be for the interest of the people of Carthage, Wilton, Dixfield, and vicinity, to set up kilns forthwith. In case three hundred casks should be burned at a time, should the demand require that quantity, it is easy to make the lime at the cost of forty cents per cask. So important is the application of lime dressing to soils, where wheat crops are to be raised, I apprehend the farmers will not let this limestone remain as it has been for ages—a buried treasure.

Specimens of mineral waters were brought to me from Jay, and on testing them by chemical means, I found they contained carbonate of iron and sulphate of lime, but they are too weak to have much efficacy as chalybeate waters.

On the farm of Mr. Woodward, there occur boulders of

grauwacke, with terebratulæ impressions, the rounded rocks being three feet in diameter. These boulders evidently came from the great bed to which I have formerly alluded, as crossing the country from Parlin Pond to the Aroostook river, and were deposited here by diluvial transportation from the north.

On Mr. Pike's farm, the rocks are mica slate, and run N. 55° E., S. 55° W., dipping to the N. W. 70°. On the ledges there are diluvial scratches, running N. 15° W. and S. 15° E., which are from one to two inches in width, and half an inch deep.

TEMPLE. In this town, I examined the estate of Mr. Joel Varnum, an old gentleman who is very curious in mineral matters, and has made quite a collection of curiosities, upon which he places high value. The most important of his minerals, however, appeared to be several beds of blue granular limestone, which are from ten to thirty-five feet wide, and run N. E., S. W., for a long distance, dipping to the N. W. This limestone can easily be wrought to the depth of twelve feet by the immediate drainage. The limestone is enclosed in micaceous and talcose slate strata, the latter rock having such a degree of softness as to cut like soapstone into fire jambs, &c. It is a valuable rock for building lime kilns, as it withstands perfectly the action of fire. It may, therefore, be of value to the inhabitants, for that purpose. Mr. Varnum saves the saw-dust of this rock, for the purpose of sharpening razors, and he assured me that he sold it for six cents per ounce. Some of the more silicious varieties of the talcose slate, he cuts into hones, which he values at twenty-five cents each.

From Wilton, I went to Farmington, and there took a number of observations for latitude of the place, and for variation of the compass. Latitude 44° 42^m 30^s; variation by sun's amplitude, 11° 20^m W. My object in this excursion, was to learn more facts relating to the iron ore of Phillips; but the state of the weather prevented our fully accomplishing that purpose.

10th October, we set out from Phillips to explore the crest

of Saddleback Mountain, and travelled to Madison, where we obtained a guide to conduct us through the tangled woods, and to aid us in carrying our mineral specimens and instruments. The heavens looked unfavorable to our enterprise, but we hoped for clear weather, and set out for the mountain. Travelled through the thick forest, until we came to a hill, seven hundred and twenty feet high, clad with spruce trees and composed of loose blocks of granite. We then descended into a valley, in view of the mountain. Arriving near the borders of a little pond, we pitched our tent, and encamped for the night. A heavy tempest rolled over the mountain to the westward, and gave us but little encouragement, since this betokened a storm. During the night the rain descended in torrents, and all the next day continued, so that we were completely drenched with water. The mountain was completely enveloped in clouds and darkness. Waiting until noon, without any prospect of clear weather, it was resolved by unanimous consent, to abandon our attempt for a while, and we returned to Phillips. The storm continued incessant for eight days, and the whole mountain top was thickly clad with snow, so that all prospects of making a successful exploration for iron ore, were cut off for the season.

During the stormy weather, we remained at Phillips, and finished our tabular calculations, drawings, &c. &c.

16th October, we set out for Kingfield, passing through the town of North Salem, for the purpose of making some sketches of Mt. Abraham, and in order to renew our former observations at Heath's. 11½ A. M., 16th Oct., at Heath's, barometer 29.162, T. 9° cent.

16th, Kingfield, 1¼ P. M., barometer 29.468, T. 10° cent. 6 P. M., barometer 29.550, T. 8° cent.

Visited Boynton & Quint's farms, in Lexington, where large masses of limestone occur, scattered in the fields, and have been used in attempting to make lime. It is too poor a rock for the purpose, and is not *in place*. The ledges are silicious slate, containing frequent veins of quartz. Porphyritic granite, in boulders and huge blocks, occurs

abundantly in the soil. Pyritiferous slate also abounds. Being satisfied that the limestone was not available, I returned to Kingfield, where I obtained some interesting agricultural information. The soil is of good quality, bearing good crops of potatoes and of wheat. Benjamin Webster informed me that he cultivated about half an acre of intervale land, where the crop had been winter killed—and ploughing, without harrowing the ground afterwards, planted ten bushels of potatoes, and manured with nine cart loads of long barn manure, which, instead of being put into the hills, was spread upon the surface. From this planting, he obtained one hundred bushels of excellent potatoes. Beside this field, was another, which was treated in similar manner, but the manure was harrowed in. From one and a half acres, but one hundred and twenty bushels of potatoes were raised, and they were not so large or good as those above mentioned. This fact seems to denote some advantage in superficial manuring; but we cannot decide so important a question without other and more complete evidence.

One and a half bushels of wheat, sowed upon three quarters of an acre of land, yielded to the same farmer, thirty bushels of wheat. The average crop in town does not, however, amount to more than fifteen bushels to the acre, while the largest crops are forty bushels.

It was our intention to have explored Mt. Bigelow, a lofty mountain upon Dead River, but the snow covered its surface and forbad any researches into its geology, so that we reluctantly abandoned the enterprise for the season, with the intent of taking up the Dead River section, on a future occasion, and completing it at once.

Mt. Bigelow from New Portland.

From Kingfield, we went to New Portland, and on our way examined the estate of Mr. Thomas Wyman. The rocks are strongly charged with pyrites, which is magnetic, causing a powerful deflection of the magnetic needle. 18th October, 7 A. M., at New Portland, barometer 29.930, t. 6° cent.

The village of New Portland is a large and flourishing town, having a pretty good soil, bearing crops from twelve to forty bushels, according to the soil and the dressing. From the specimens of the wheat seen at the flour mill, I should not consider it generally of the first quality, it not being full and heavy; but there were some samples of excellent quality. From the nature of the soil, I should have anticipated such a result, for it is generally of granitic origin, and is poor in lime, a deficiency easily remedied.

Limestone occurs near the borders of the Vineyard, and Mr. Wall having visited the locality, brought home some specimens resembling the variety of rock which occurs in the town of Strong. The masses were, however, loose, but by searching, it may be found in place.

On the road to Anson, three miles east from Hanson's, there are diluvial marks on the silicious slate, which run N. 10°, 15° W., and S. 10°, and 15° E. The slate strata run N. 55° E., S. 55° W., and are nearly vertical in their inclination.

On Mr. Churchill's farm, a very rich pyritiferous slate occurs abundantly, and by its decomposition, it has produced a small bed of excellent bog iron ore in the meadow below, which is but two rods square, and about one foot thick, and hence insufficient for practical uses in the manufacture of iron. It will, however, make fine red ochre, on being burned and pulverized, and may be used for paint. The pyritiferous slate is so rich in sulphuret of iron, as to be worth working for copperas, and will make at least its own weight of the crystalized salt. The present price of transportation of goods from this place to Augusta, is fifty cents per cwt., and thirty-two cents to Waterville. Wood is worth about one dollar per cord, on the spot. Even at this rate, the manufacture of copperas from this rock might, if skilfully managed, prove profitable, when factories upon the Kennebec waters produce a demand for the article.

From Anson, we returned to Augusta, sending a party of the assistants to examine the roofing slate, above Bingham, while I went to Norridgewock and Skowhegan, for the purpose of obtaining some additional information, and to allow the draftsman to make sketches of several interesting scenes, on the way.

Near the north line of Clinton, upon the margin of "Fifteen Mile Stream," in Skowhegan, there occur several large deposits of bog iron ore, some of which is solid and of good quality; while a much larger proportion is in the state of fine powder, or yellow ochre and brown oxide of iron. The solid ore makes good iron, but the pulverulent variety contains a considerable proportion of arsenic, derived from the arsenical pyrites, from the decomposition of which the bog ore was formed. It is unsuitable for the manufacture of bar iron, but will make cast iron of sufficiently good quality for ordinary castings, and there is an ample supply of ore for a blast furnace.

On the estate of Mr. Sampson Parker, I examined the length, breadth and depth of iron ore, and obtained the following results:

Length, 480 feet—width, 240—average depth, one foot.

$480 \times 240 = 115,200$ cubic feet of ore.

On the estate of Mr. Jonas Burrill, there is also a bed of bog iron, 1320 feet long, 33 feet wide, and one foot average depth:—$1320 \times 33 = 43,560$ cubic feet of ore.

Two miles northwest from this place, there is a large deposit of similar ore, upon the estate of Messrs. [illegible] Sanburn & Foster, the deposit being discovered in numerous places over an area of four acres of swampy land.

On the land of Mr. Pitts, three miles northwest from Parker's, there is also a deposit, one hundred rods in length, and from one to two rods wide. Southeast from Parker's, on the land of Mr. Hood, there is also a bed of good and solid bog iron, of considerable extent, estimated to be about thirty acres of swamp, the greater part of which is filled with iron ore. In Mr. Sanburn's swamp, there is an area three quarters of an acre filled with bog iron.

The whole extent of the swampy land, in which the above mentioned ores occur, is from two to three miles in a northwest and southeast direction, bordering upon the Fifteen Mile Stream. It is evident that a sufficiency of the ore may there be obtained for the supply of a blast furnace capable of smelting from one to two tons per day; wood, suitable for making charcoal, abounds in the vicinity—standing trees being worth twenty-five cents per cord, and the cutting fifty cents per cord. Charcoal can be made at six cents per bushel, in any quantity desired, and the hauling of it two and a half miles to the furnace, would cost a dollar per hundred bushels.

There is a fall of six feet pitch in the river, one mile northeast from Pishon's Ferry, where a dam eight feet high, may be built, and a pond flowed back for the distance of two and a half miles, so that the iron ore can be brought down by scows, to a furnace erected at the dam. Limestone, suitable for a flux, abounds in the vicinity.

Should a furnace be erected at this place, the [illegible] ore should be selected for smelting; and if it is roasted before it is introduced into the furnace, it will be in a great measure freed from the traces of arsenic, and

will then make good cast iron. I have examined the bar iron, made from the fine powdered or yellow ochre, and find that its bad qualities are owing to the existence of considerable quantities of arsenic, which it contains, and that substance prevents its welding firmly, and makes it "short" or brittle under the hammer. During the attempts to weld bars of such iron, the white fumes of arsenious acid are observed to rise from the iron, and the arsenical or garlic odor fills the room in which the operation is carried on.

On account of the above mentioned bad qualities of the Clinton bog iron, the forge formerly established at that place was abandoned, the iron having a very low reputation in the market. Arsenic does not, however, do any essential injury to common cast iron, and hence I advise the working of the above described ore into castings. If it is collected just as it is found, the lumps and ochreous oxide being mixed together, I should advise the washing out of the fine powder by means of a current of water, and by this process the good ore may be completely separated, and the fine ochre which subsides from the water, may be roasted, and thus converted into red ochre for paint, which may be made in any desired quantity, and afforded at a very low price.

The following analyses exhibit the composition of the iron ores from Skowhegan. 100 grains of bog ore from Mr. Foster's swamp, of brownish color and compact structure :

Water, - · -	18.0
Silex, - - -	13.4
Per. oxide of iron, -	68.6=Iron, 48 per ct.
	100.0

On roasting the ore, there is a slight odor of arsenic, which is in too small quantity to be separated.

100 grains from Mr. Jonas Burrill's bog :

Water and vegetable matter, -	33.0
Silex, - - - - - -	4.4
Per. oxide of iron, - - -	62.0=Iron, 42 per cent.
	99.4

At Brown's Corner, in Clinton, on the estate of Mr. Luke Brown, quarries have been opened for limestone, which has been burned under the direction of Mr. Leander Hussey. The rock is a blue argillo ferruginous limestone, charged with numerous crystals of iron pyrites, and makes a brown colored lime, sufficiently strong to slake and answer for agricultural purposes. The strata run N. 50° E., S. 50° W., and dip 85° S. E.

100 grains of the limestone yield, by chemical analysis:

Insoluble slate, - - - -	43.0
Per. oxide of iron, - - - -	3.0
Carbonate of lime, - - - -	54.0
	100.0

Limestone also occurs on the estate of Mr. A. Brown, in Clinton, and specimens analyzed, give the following results:

Insoluble slate, - - - -	17.2
Per. oxide of iron, - - - -	6.0
Carbonate of lime, - - - -	76.8
	100.0

At Clinton Falls, there is also an abundance of similar limestone, occurring in regular strata which run N. 48° E., S. 48° W., and dip S. E. 76°. It contains numerous veins of calcareous spar, and is in many places of sufficiently good quality to burn into strong and good lime.

At Mr. Abijah Brown's, a well sunk to the depth of twenty feet disclosed a bed of fossil marine shells, which deposit is forty or fifty feet above the level of the Kennebec river, at that place, and this altitude corresponds very nearly with the greatest height of the tertiary deposits in Maine.

On reaching Augusta, I went immediately to Whitefield, to examine a bed of limestone, specimens of which had been sent to me. On Enoch Heath's farm, there is a bed of this rock, running N. 53° E., S. 53° W., and dips to the S. E. 80°. It is cut across by a trap dyke, eight inches wide. Southeast from this bed, occurs another of similar character, four feet wide, running in a parallel direction with the above.

Both these localities have been wrought to a trifling extent, a small kiln capable of burning fifty casks at a time, being set once a year. The lime is of good quality, and is used by the inhabitants of the town. It is not easy to drain the quarries below the depth of eight feet, and hence they are not so available as another locality which I shall describe.

On the farm of Mr. Joseph Jewett, two miles south from Davis' tavern, in Whitefield, four miles northeast from the East River, a branch of the Kennebec, a large bed of excellent limestone was accidentally discovered, in ploughing the field. The discovery having been made but a few days before my arrival, I had an opportunity of inspecting the rock, which the owner had just uncovered. The bed is fifteen feet wide, and I traced it for the distance of one hundred and fifty feet in length. It runs N. E., S. W., and dips about 80° S. E. It is favorably situated for working, and can be drained easily to the depth of fifteen feet. The rock is a white, fine granular limestone, shaded with blue clouds, and will make good lime. Wood costs from one dollar to one dollar and twenty-five cents per cord, on the spot, and labor is obtained for fifteen dollars per month. Under such circumstances, it is evident that the lime may be burned profitably.

24th October, I visited Patricktown, for the purpose of examining the iron ore, said to have been found there. Several of the gentlemen interested in the locality, accompanied me to the mine, and we examined it, and found that it was not of any value. It is situated on the farm of David Patrick, eastward of the centre of the town, and is a mass of hornblende rock, imbedded in gneiss, running N. E., S. W. The hornblende rock contains manganesian garnets, oxide of manganese, and small veins of magnetic iron ore, mixed with brown pyrites. The latter mineral would destroy its value, even were there ore enough for a furnace, which is not the case.

Union. This town is one of the most important localities on the St. George river, rich in agricultural and mineral resources, and it wants but free communication by canal with

the sea, to render it a flourishing town. Inexhaustible quarries of fine marble and limestone, and a fertile soil, would soon repay the trifling expense of locking the St. George, and would increase the wealth of the inhabitants. Surveys have been made to ascertain the feasibility of this project, and it was decided that it could be advantageously executed.—(See Report of Capt. Hall.)

Among the great beds of limestone and marble, are the following:

The Miller ledge, a bed of fine greyish white limestone, twenty-nine feet wide, running N. 48° E., S. 48° W. This rock makes a strong and good lime.

S. 25° W. from Miller's ledge, is the Orchard Quarry, twelve feet wide at the top and seven at the bottom, the depth of the opening being ten feet. It runs N. 48° E., S. 48° W., and dips S. E. 80°

Southeast from the Orchard Quarry, is the Bullin ledge, which is a very handsome white marble, clouded with grey. Its grain is bright, and it takes a fine polish, making very handsome slabs and blocks for tables, grave-stones and buildings. This bed is fifty-two feet wide, and I measured its length, and found it to be eleven hundred feet. It runs N. 33° E., S. 33° W., and dips S. E. 65°. The largest block of marble which has been obtained from this quarry, is seven feet long—two and a half feet square—and is perfectly solid and suitable for monumental work, or for sawing into slabs. Mills have been erected for the purpose of sawing the marble into slabs by water power, and gangs of fourteen saws are now in readiness for the work. Each saw cuts at the rate of six inches per day, in a block two feet long, the size of the tablets. Fourteen slabs of the above dimensions, are sawed in four days. In case fewer saws are put in action, the work can be done more rapidly. Common river sand is used for sawing the stone, but it may be done twice as rapidly with granular quartz, which may be obtained abundantly at Liberty. Blocks of marble, six feet long, two feet eight inches wide, and two feet thick, lay at the mill, ready for the saw. Mr. David

Hull, the superintendent of the mill and quarry, informed me that it was proposed to saw slabs, two feet square, and two inches thick, for encrusting brick buildings, in New-York, so as to give them the appearance of solid marble. A similar expedient was used in the buildings of ancient Rome, and I have there seen houses lined with slabs only an inch in thickness.

Near Union Common, upon the estate of Captain N. Bachelder, upon the west side of the St. George, there is an extensive bed of greyish white limestone, which runs N. 24° E., S. 24° W., and is nine hundred and twenty-four feet long, and more than thirty feet wide.

Upon Harden's ledge, one and a quarter miles southeast from Cobb's tavern, upon the shores of a pond, there are also extensive beds of limestone; one of which is ninety-one feet wide, and twenty rods long, and can be wrought to the depth of twenty-nine feet. Another bed occurs near the Point, and runs across the promontory. The limestone is intersected at the southwest extremity by a vein of granite, which has been thrown up through the limestone, since its deposition.

Considering the great number and magnitude of the limestone beds in Union, it will appear that there is but one obstacle to the successful manufacture of lime for exportation—and that is the distance which it is necessary to transport it by land carriage, twelve miles to Thomaston.

The following estimates will show the relative cost of the business at Union and at Thomaston, for 300 casks of lime.

UNION.		THOMASTON.	
Quarrying, six cents per cask,	18 00	Quarrying, at 7 cts. per cask,	21.00
Thirty cords of wood, at 1.50,	45.00	Hauling to port, 10 cents,	30.00
Packing kiln, &c. - -	10.00	Thirty cords wood, at 3.00,	90.00
Four days attendance on kiln,	10.00	Labor in packing kiln,	10.00
		Attendance on kiln,	10.00
	$83.00		
300 lime casks, at 20 cents,	60.00		$161.00
		300 lime casks,	60.00
For 300 casks of lime,	$143.00		
Per hundred casks,	47.66		3)221.00
Transportation to Thomaston,	25.00		
		Per 100 casks,	77.00
Per 100 casks, at Thomaston,	$72.66		72.66
		Per 100 in favor of Union,	$4.50

It will be seen, then, that the Union lime can be afforded four cents less per cask than that manufactured at Thomaston; and if it brought the same price in the market, the business could be carried on profitably, were it not that by means of the perpetual kiln, the Thomaston people can now burn lime from ten to fifteen per cent. cheaper than is estimated above.

26th October, 2 P. M., at Cobb's hotel, barometer 29.680, T. 11° cent.; 5½ P. M., 29.652, T. 6½° cent.; 6½ P. M., 29.652, T. 3° cent.

Passing through the town of Washington, I rode to Liberty, for the purpose of examining the extent of certain beds of granular quartz, which I described in my First Annual Report. A specimen of this valuable rock, was first discovered by my late friend, Capt. Uriah Coolidge, of the Eastport Cutter, while we were cruising upon the coast—the captain having taken a ride out to Liberty, obtained the specimen from the ledge, which was at first supposed to be of white marble, so closely does it resemble granular dolomite. While I was instructing the assistants in the art of examining minerals, I took a piece of this rock, and discovered it to be pure granular quartz, and have already described it as such. My active engagements elsewhere, have prevented me from exploring its extent until now, and thus it has remained almost un-noticed. Capt. Bickford E. Matthews is the owner of the land on which this mineral occurs, and he aided me in every possible manner, in ascertaining the quantity that could be depended upon, in case glass works should be erected for its manufacture. The granular quartz I found to exist in beds, included between strata of mica slate, running N. E. and S. W., and dipping to the S. E. The widest bed measured eleven feet, and it is exposed to view for the distance of thirty-one feet, and can be drained easily to the depth of twenty or thirty feet. Beside this, there are numerous smaller beds, which it is more difficult to measure, as they are quite irregular.

Passing through the woods, half a mile northwest from this locality, we come to several other similar beds and veins,

one of which is from two to three feet wide, and extends fifteen rods in length. It can be drained to the depth of twenty feet or more, very easily. A number of narrow beds and veins, from a few inches to a foot in width, also occur, running parallel to the above. From measurements of those beds that are uncovered of soil, it appears that there are about three thousand tons of the granular quartz that may be seen. Besides this, the great beds evidently run under, and are concealed by the soil, and extend to a much greater distance than we were able to explore. I have no doubt that an ample supply of the quartz may be obtained to supply a glass furnace; and it may be converted into beautiful glass by the usual operations. It is much purer than any sand that can be obtained, being free from oxide of iron, and vegetable matter. When burned in the fire, and then thrown into water, it becomes friable and is more easily crushed than loaf sugar, so that it may be pulverized by an ordinary crushing wheel of iron, turned like those used by tanners in the bark mill, by horse or water power. Wood is worth from $1.00 to $1.50 per cord, and slabs from the saw-mill may be obtained much cheaper, and will form the best fuel for the glass furnace. Waldoborough is the nearest seaport, and is fifteen miles distant by the road. Price of transportation to that port, two dollars and fifty cents per ton. Belfast is eighteen miles distant, but the road is good, and the same price is paid for transportation of goods, viz. $2.50 per ton.

From the above elements, it is easy for the manufacturer to calculate whether it will be profitable to erect glass works at Liberty. There is no such establishment in Maine, and since every person uses glass, there will be demand enough to take up all that any one furnace could manufacture.

I have made several kinds of glass from this rock, for the purpose of shewing its quality, and although the specimens that I have made and deposited in the Cabinet, are rich and beautiful, they are not to be compared in brilliancy and transparency, with glass made on a large scale, for it is very difficult to regulate the heat applied to a small crucible.

I should recommend the establishment of works for the manufacture of window glass, either crown or cylinder, as may be thought expedient. The amount of capital required is not more than forty or fifty thousand dollars; and if well managed, would prove a profitable investment. Window glass is made of various qualities, according to the purity of the materials, and the skill of the workmen; and I doubt not that an article, equal in beauty to the best Bohemian crowns, may be made from this rock. The Bohemian glass is made of the following ingredients:

Quartz, or silicious sand,	[illegible]
Carbonate of lime, pulverized marble, or air slaked lime,	[illegible]
Carbonate of potash, pure pearlash,	[illegible]

Sometimes a little saltpetre or oxide of manganese and arsenic, is also added, to remove vegetable matter, or to give a peculiar shade to the glass.

Ordinary WINDOW GLASS is made of:

	Silicious sand, or granular quartz,	100
	Carbonate of lime,	35 to 40
	Dried carbonate of soda,	30
	Broken glass,	180
(Sometimes used)	Per. oxide of manganese,	0.25
	Arsenic,	0.20

Mirror, or PLATE GLASS, is made of the following ingredients:

Granular quartz,	[illegible]
Dried carbonate of soda,	100
Air slaked lime,	[illegible]
Broken glass in powder, (calcin,)	[illegible]

CRYSTAL GLASS is composed of:		FLINT GLASS.	
Quartz,	300	Quartz,	300
Red lead,	100	Red lead,	[illegible]
Carb. potash—pure,	120	Potash,	[illegible]
Broken glass,	300	Nitre,	10
Arsenious acid,	0.45	Arsenic,	[illegible]
Ox manganese,	0.60	Ox. manganese,	[illegible]

It would require too much room in an annual Report to explain all the manual operations of the glass house; and I must, therefore, refer the reader to the only complete work on this interesting subject, which may be found in Dumas' Traite de Chimic Appliquèe Aux Arts, tome 2e. A more detailed account of the chemical principles, and the methods of obviating the difficulties in this art, will be contained in my final or complete Report, which will be drawn up on the completion of the survey of the State.

AGRICULTURAL GEOLOGY.

Of all the arts, I know of none more likely to be improved y geological examinations, than that of Agriculture; since ie composition of soils indicates their fertility, or capabilities f improvement, and the causes of barrenness. The science f geology demonstrates the origin, and distribution of the ineral matters, constituting the basis of all soils, to which iey chiefly owe their peculiarities. I know that it is a ivorite opinion with many agriculturists, that the mineral onstituents of a soil have but little, if any influence on their rtility; and that they suppose the whole secret resides in ie presence of certain vegetable or animal matters; but such theory is at once exploded by an attentive examination of he natural soils, with their peculiar vegetation; for it will e seen that there are regular zones of vegetation, peculiar o each geological district, in which the same vegetable or nimal matters are present, but which differ essentially in ieir mineral constitution. Thus how different is the soil erived from granitic rocks, from that which is formed by the isintegration and decomposition of limestones and slates. low peculiar is the vegetation which follows the great bands f trap rocks, and how remarkable is the growth on the ncient clay loams, of tertiary deposition. Whoever conders the attempts made to raise wheat upon soil totally estitute of lime, will at once appreciate the value of that ineral substance, and its importance in the production of rain. An imperfect or blighted product is sure to follow the lanting of this grain upon soils destitute of lime, while it is ell known that certain districts, where the soil contains iis mineral, are always favored with luxuriant and heavy rops. This is one of the settled points in agriculture, and

one which every farmer should duly appreciate, if he wishes to prosper in his art. Indian corn requires but little, if any lime, and hence we see excellent crops of that grain raised upon sandy plains, unsuited to wheat. Rye, likewise, will do pretty well without it, but it is always more full and heavy where it exists in the soil; and by attending to this circumstance, the value of the crop may be greatly improved.

The overlapping of soils, from diluvial causes, is also a point greatly illuminated by a knowledge of geology; and we are able, by means of a good geological map, to predict the nature of a soil in a given district, with as much certainty as we refer back certain rounded and transported stones to their native beds. It is also easy by the geological and topographical features of a country, to predict the nature of the alluvial or intervale soils, which have been washed down from the hills and mountains by brooks, rivers and rains; and such knowledge not only helps us to account for the phenomena in question, but also in the selection of suitable grounds for our various crops.

The situations in which are found substances capable of being used for the amelioration of soils, is also pointed out in a geological survey; and a scientific farmer soon learns to avail himself of the natural resources of the country. We also are able to indicate by the natural growth, the nature of the soil, and to point out to the farmer tracts of country which will form the best settling lands; and by the application of the science of chemistry, we indicate to him the peculiarities of the different kinds of soils, and the mode of renovating those which are deemed to be exhausted.

There are certain tracts, upon which gypsum acts favourably, while on others it does no good; and there are districts where liming is required, and others where it is not. Some soils require the introduction of a quantity of vegetable matter, and we show the farmer the cheapest mode of introducing it; others are wanting in certain saline matters required for peculiar vegetation, and the nature and quantity of such matter required, is indicated by a chemical analysis of the soil. Enormous quantities of valuable

materials in manures, are lost by a want of chemical art in preserving them, and still more is wasted by improper application. The causes which effect these results, are well known to chemists and geologists, and by special examinations, the knowledge is applied to particular cases with skill, and with certainty in the result; whereas vast amounts of both time and money are lavished in idle experiments, by those who are unacquainted with the laws of nature.

It is to correct these errors in agriculture, that science, "the handmaid of the arts," comes to our aid, and by learning and following her laws, we soon come to a more perfect knowledge of the subject, and with the lever which she puts in our hands, overthrow all obstacles. Why is it that the noble art of agriculture, holds so low a rank in the opinion of men, if it be not that reason has left the field, and given place to empyricism? If it is ever to be restored to its pristine rank, and a new Eden is to bloom, with its fruitful fields, it must be by bringing the GOD-LIKE attribute of man to the task of renovation. I have always been startled with the gratuitous assumption that knowledge and reason were not to be the rules of agricultural labor. That any one knows enough to be a farmer, and that the *concentrated experience of the world was not to be put in competition with the narrow circle of individual experience!* Is it indeed so with any other science or art? or should we not conceive it to be arrant folly for any one to pretend to learn any other business, without availing himself of the knowledge of others? I know that intelligent men make no such gratuitous assumptions; but still there may be many, who are not aware of the application of certain sciences which I mention, to the improvement of this most important of arts, or they may have but a partial glimpse into the arcana of science. Others may have formed an opinion, that since science is confessedly imperfect, that it cannot meet the exigencies of the case, but that innovations upon ancient customs are fraught with danger. To such we may reply, that enough is already known to render the art great service, and that knowledge is marching on with such rapid strides, that we should hasten

in our movements, lest all hope of [illegible] lost.

I knew a gentleman once, who stated [illegible] for the science of chemistry to [illegible] engaged in the study. It was then [illegible] acquire the mass of information [illegible] sion of that science. But now, look [illegible] knowledge on this subject, which has [illegible] ponderous volumes. Is there now any [illegible] overcoming the difficulty? So it will shortly [illegible] tific agriculture. But comparatively few are the [illegible] now—but with the new impulse it has [illegible] years it will cause "meek eyed patience to [illegible] despair," when contemplating the mass of materials [illegible] be collected for our instruction. "Little by little [illegible] makes its nest;" and so must we gradually [illegible] materials of knowledge. Let the young farmer, [illegible] be on the alert, and not let the rest of the world [illegible] start of him in his art. Agricultural colleges are [illegible] throughout our country, and the time is not far [illegible] we shall see them in full operation. Analytical [illegible] and geology, will be among the essential principles [illegible] farmer's education. Botanical knowledge will [illegible] peculiarities of plants, and their adaptation to peculiar [illegible] and chemistry will teach us so to modify our soils as to [illegible] duce such results as are required. In the mean time, [illegible] professional men must take the burthen upon their [illegible] and aid the farmer in his first steps in science. [illegible] and good fellowship, will make the burthen light, and [illegible] parties will profit by their association. The farmer, [illegible] to one spot, has great advantages in obtaining facts, [illegible] more fully illustrate the knowledge of that particular [illegible] The facts so obtained, are to be collated and duly [illegible] so as to become capable of forming general rules or [illegible] ciples, for the guidance of others. Soils remarkable [illegible] peculiar vegetation, luxuriant or barren, form subjects [illegible] particular interest, capable of explanation by [illegible] analysis. The present state and future condition of [illegible]

can in a certain degree be ascertained by a knowledge of their geological origin, and the nature of the chemical reactions which will take place in it. Advantage may sometimes be taken of defects in soils, to render them the most powerfully beneficial. Thus, in the town of Saco, there is an intervale plain, belonging to Mr. I. Jordan, having several remarkable substances in it, which nothing but a knowledge of geology and chemistry could explain or improve. There is a kind of clay marl, filled with minute and almost invisible particles of pyrites or bi-sulphuret of iron, composed of 54 parts sulphur and 46 of iron. The marl also contains three per cent. of carbonate of lime, and the remainder is clay. When this substance is first dug up, it is without any saline taste, and nearly inert; but upon exposure to the air, it crumbles, and after a while, becomes charged with copperas or sulphate of iron, which is formed by the oxidation of the sulphur and the iron, by atmospheric action. While in its first stages, it acts as a powerful fertilizer, for the sulphuric acid is taken from the iron and combines with the lime, forming gypsum or sulphate of lime, while the oxide of iron is deposited. After a while, the copperas or sulphate of iron, constantly forming, gains the ascendency, and then has powerful corrosive properties, nine or ten per cent. of suphuric acid being produced; and having no lime with which to combine, it attacks the roots of the plants and kills them.—(See chemical analysis of this copperas marl.) Thus, as Mr. Jordan happily expressed himself, " it first makes the corn grow, and then eats off its roots and kills it." Certain other plants of the *gramina*, are capable of withstanding this substance, if not in great excess; and hence herd's grass, rye and wheat, are not so likely to be destroyed by it, since they are armed with a coat of mail composed of silex, which envelopes their whole surface; but all herbaceous or tender plants are cut off by it.

Here, then, we have a defect to remedy, and to turn to our account, and it is an extremely simple case, for we have only to add a sufficiency of lime to the copperas marl to render it one of the most valuable and powerful fertilizers. Thus a

compost heap affords us an accessible remedy, and the enemy is soon tamed and made subservient to our will. The origin of this pyritiferous clay is at once explained by geology, which teaches us that it is composed of the fine particles of pyritiferous slate rocks, that have been deposited by water. So also the occurrence of nodules of shot and nut iron ore in it, and the mineral waters which flow from the meadows charged with sulphate of lime explain themselves by the reaction of carbonate of lime upon sulphate of iron, an exchange of elements taking place in accordance with the well known laws of chemical affinity.

Peat also occurs abundantly in the same meadow, and by a little chemical skill may be converted into an excellent manure by means of a mixture of lime and a little barn yard manure or any animal matter. Thus three or four cords of the peat mixed with one cord of animal manure, and treated with a cask or two of slaked lime will make a compost superior in value to five cords of the best stable manure alone. They ought to be placed in alternating layers, thus:

PEAT,

LIME,

ANIMAL MANURE,

PEAT,

&c.

The whole forming a regular compost heap. The chemical reactions which follow are chiefly thus:—

The lime extricates a large quantity of gazeous ammonia from the animal matter, which is absorbed by and enters into combination with the peat, and is thus retained ready for use in the state of ulmate or geat of ammonia—(a most powerful manure)—and the lime becomes completely carbonated or air slaked by the carbonic acid given out during fermentation, and in this state is a proper and permanent ameliorator of the soil. The peat is converted into a powder and soluble pulp, and becomes more suitable for the nutriment of plants. While if lime and animal matter was used in excess we shall have also a considerable quantity of carbonate of ammonia, in the peat, a well known and powerful saline manure.

In case the soil is sandy, the clay marl, neutralized with me, is the most proper amendment for it, and such is gen-rally the condition of the fields in Saco, so that by a proper se of this marl the happiest effects may be realized by the rmers in that town.

I could quote other instances of the kind, but the above lly illustrates my meaning, and will show how favorable an fluence scientific knowledge would exert in agriculture, 'ere it more generally appreciated.

The principles which I have laid down, have been adopted y several distinguished farmers of Massachusetts, and their xperience most fully corroborates the truth of the theory iculcated.

I need but appeal to the experience of one of our most itelligent farmers in Massachusetts, Elias Phinney, Esq., of exington, to demonstrate the correctness of the rules we ave laid down, with regard to the use of peat for compost anure, or to the beautiful farm of Benjamin Bussey, Esq. f Jamaica Plain, Roxbury, where similar results have been btained.

LEXINGTON, January 30, 1830.

DR. CHARLES T. JACKSON,

Dear Sir:—I herewith send you a sample of my peat. I m very desirous of availing myself of the benefit to be lerived from a chemical analysis of the same, which you indly offered to make. A more intimate knowledge of the ature and properties of peat, which can be obtained only by scientific examination of its constituent parts, would enable armers more justly to appreciate this valuable species of and. It is from a want of this knowledge, that our exten-sive tracts of low meadow and swamp lands have hitherto been esteemed of little, or no value. Allow me to say, sir, that I know of no way, in which you could render a more essential service to the public, more especially to farmers, than by enabling them to convert their unproductive and unsightly bogs and morasses into luxuriant fields, and sources of wealth. I consider my peat grounds by far the most val-uable part of my farm, more valuable than my wood lots for fuel, and more than double the value of an equal number of acres of my uplands, for the purposes of cultivation.

In addition to these, they furnish an inexhaustible supply

of the most essential ingredient for the manure heap. A statement of the uses, to which I have appropriated peat lands, and my management of them, though very imperfect, may serve to give you a partial conception of their value and uses, and at the same time enable you to see how important it is that the farming community should have more information on this subject.

In the first place they are valuable for fuel. I have for twenty years past resorted to my peat meadows for fuel. These, with the prunings of my fruit trees, and the brush from my uncleared lands, have given me my whole supply. The prunings and brush are bound in bundles, and housed, and with the help of a small bundle of these faggots, and peat, a quick and durable fire is made. It gives a summer-like atmosphere, and lights a room better than a wood fire. The smoke from peat has no irritating effect upon the eyes, and does not in the slightest degree obstruct respiration, like the smoke of wood; and it has none of that drying, unpleasant effect of a coal fire. The ashes of peat are, to be sure, more abundant, but not more troublesome, and are less injurious to the furniture of a room, than the ashes of coal.

The best peat is found in meadows, which have for many years been destitute of trees, and brush, and well drained, and where the surface has become so dry, and the accumulation of decayed vegetable matter so great, that but little grass or herbage of any description is seen upon the surface. If the meadows are suffered to remain in a wet and miry condition, the wild grasses and coarse herbage will continue to grow, and the peat be of a light and chaffy texture, filled with undecayed fibrous roots. By draining they become hard, and the peat becomes compact and solid, and the cutting out, and carrying off greatly facilitated. A rod square, cut two splittings deep, each splitting of the length of eighteen inches, will give three cords when dried. It may be cut from May to September. If the weather in autumn be very dry, the best time for cutting will be from the middle of August to the middle of September. If cut the latter part of summer, or early in autumn, it dries more gradually, and is not so liable to crack and crumble, as when cut early in summer. The peices are taken out with an instrument made for the purpose, from two to three inches square; and if of good quality, will shrink about one half in drying. It is considered a day's work for a man, a boy and a horse, to cut out and spread a rod square. The man cuts it out, and lays it upon a light kind of drag, made for the purpose, and it is drawn off

by the horse, and spread by the boy as thick as the peices can lay singly. After becoming dry enough to handle without breaking, it is made into piles, cob-house fashion, of from twelve to twenty peices in a pile. It will then require about four weeks of dry weather to render it fit to be housed for use. The top, or turf, is thrown back into the pits, from which the peat is taken; and if well levelled, and the ground drained, it will, after the first year, give a large crop of foul meadow, or other lowland grass. Peat, taken from land which has been many years drained, when dried, is nearly as heavy as oak wood, and bears about the same price in the market.

The value of peat and swamp lands for tillage, is now pretty well known, and acknowledged. Some years since, I occasionally sold to my neighbors a few rods of my peat land, yearly, to be cut out for fuel, at three dollars per rod, being at the rate of four hundred and eighty dollars per acre; but finding this sum to be less than its value for cultivation, especially when laid to grass, I have declined making further sales at that price. I have raised upon my reclaimed meadows, seventy-five bushels of corn, five hundred bushels of potatoes, or from four to five tons of the best hay, at a first and second cutting, to the acre, at a less expense of labor and manure, than would be required to produce half this crop upon uplands. To render these lands productive, they should be thoroughly drained, by digging a ditch around the margin of the meadow, so as to cut off the springs, and receive the water, that is continually flowing in from the surrounding uplands. If the meadow be wide, a ditch through the centre may be necessary, but this will be of no use without the border ditches. This being thoroughly done, and the surplus water all drawn off, the next step is to exterminate the wild grasses, and herbage of every kind, that grow upon the surface. To effect this, the method heretofore generally, and now by some pursued, is to cover with gravel or sand, top dress with manure, sow the grass seed, and then rake, or bush it over. This, for the first year or two, will give a good crop of hay; but after this, I have invariably found that the more coarse and hardy kinds of wild grass would work their way through the sand, or gravel, and entirely supplant the cultivated grasses—when the whole must have another covering, or be abandoned as worthless. If to be planted with corn, or any of the root crops, my course has been to turn over the turf or sward with a plough having a wrought iron share or coulter, ground to a sharp

edge, in the driest season, say in the month of September, roll down as hard as possible, carry on in the winter a sufficient top dressing of compost, twenty cart-loads to the acre, and in the spring plant with corn, or roots, without disturbing the sod. When the corn or roots are taken off, the surface is made smooth with the cultivator, or hoe and harrow, and late in November, or just before the heavy frosts set in, sow with herd's grass and red top seed, half a bushel of the former and one bushel of the latter to the acre. The field is then rolled, which completes the process. If the plough does not turn the sods smooth, it will be necessary to follow it with the bog hoe, to level the uneven places. By keeping the sod undisturbed in the cultivation, a more firm and compact surface is formed, upon which oxen or horses may work, generally, without danger of miring. If the land is intended for grass, without the intervention of a hoed crop, the turf is turned over with the plough, as before stated, in August or September, or as early as the surface becomes dry enough to admit the oxen or horses upon it; then follow with the bog hoe, and turn over such parts as the plough has left unturned, make the whole smooth with the hoe, and late in November, spread on a top dressing of compost, not less than twenty cart loads, made half of loam, and half of stable manure, to the acre; then sow the grass seed, and bush, and roll down. If the ground be miry, so as to render the use of the plough impracticable, the bog hoe must be resorted to, and the whole turned over by hand, and top dressed, and seeded to grass, as above stated. The cost of turning over with the hoe, will be twenty dollars per acre, at the usual price of labor. This mode of culture completely subdues the natural wild grasses, and gives a compact and rich surface of vegetable mould, which will give an abundant crop of the best English hay for four or five years, without the aid of more manure. If the sod is disturbed and attempted to be pulverized in the course of the cultivation, the surface, when laid to grass, will be loose and spongy—an extra top dressing of loam and manure will be required, and after all, the surface will not become so compact, nor the produce by any means so great. Should meadows be found too soft and miry to admit of their being ploughed in the summer, or autumn, and the expense of turning with the hoe should be thought to be too great, I would advise ploughing in the spring, when the frost is out to the depth of three or four inches, carting on the manure, and then sowing or planting at a convenient and proper season. The

rt of reclaiming these low meadows, consists in taking off all he surplus water by judicious draining, and in thoroughly xterminating the natural herbage and grasses. This being ffected, we have our rich bottoms, equally as productive as he deep alluvials of the west, and obtained at a cost and acrifice infinitely less.

The third particular, in which peat lands may be considered raluable to the farmer, consists in furnishing him with a very mportant ingredient for his compost. Peat is made up prinipally of decomposed vegetable substances, with a portion of the lighter particles of vegetable mould, washed in from he surrounding highlands. But when taken fresh from the pit, it contains certain antisceptic properties, injurious to regetation, which must be absorbed, or neutralized, by a combination with other substances, in order to render it food for plants. This may in some measure be effected by exposure to the action of the air and frost. Where the surrounding uplands are composed of gravel or sand, the peat or swamp mud may be called silicious, and is less valuable for manure, especially if the adjacent uplands rise abruptly; when composed principally of clay, the peat is aluminous—this is frequently found resting on beds of marl, and is considered much richer, and more valuable for the compost heap.

I have annually, for some years past, used on my farm some hundreds of loads of peat mud, which is either thrown into my hog stye, or mixed with fresh stable dung, or with lime. When mixed with green stable manure, the proportions are two parts of peat mud to one of dung; and I am confident, from repeated experiments, that a load of this compost, well mixed and fermented, will give as great a produce, and a more permanent improvement to the soil, than the same quantity of stable manure. In this opinion, I am not alone. Other accurate and intelligent cultivators, have made similar experiments with similar results.

The vegetable substances of which peat is composed, having been decomposed in stagnant waters, they have not passed through a putrefactive fermentation, and are therefore supposed to retain much of their natural oils, gums and acids. Peats, in this region, are also supposed to contain portions of sulphate of iron, or copperas, oxide of iron, &c. This opinion is formed from noticing the difference between the effect produced by using the peat mud on grounds, when first taken out of the meadow, and that which is produced after fermentation, with stable manure, or by mixing it with

lime. The ashes of peat have little or no perceptible effects, when used alone, but by mixing them with lime, they become a valuable manure.

That our peat may possess other and different properties, which are in a greater or less degree injurious to plants, is highly probable. These can be detected and remedied only by the aid of science. It is to the agricultural chemist, that the practical farmer must look for a development of his resources, to remove the obstacles which impede his progress, and to impart that information which will give confidence to action, and a successful issue to labor.

With an earnest desire that you may persevere in your useful labors, I am, dear sir,

With the highest respect,
Your obedient servant,
E. PHINNEY.

Having, two years since, given Dr. N. C. Keep some instructions, relating to the management of peat compost, that gentleman communicated them to his father, an old and intelligent farmer, residing at Longmeadow, upon the Connecticut river; and the experimental trial having been made to his satisfaction, he politely furnishes me with the following interesting statistics:

To Charles T. Jackson, State Geologist, &c.

Dear Sir:—Being much indebted to you for information in regard to the use of peat, as a manure, and the mode in which its acid properties may be not only neutralized, but made a most valuable food for plants, I beg leave to state, that in the fall of 1836, I took from my bog about three cords of peat, and placed it in a pile on the nearest solid land, in the woods. It remained there undisturbed until sometime in November, 1837. By the action of the *frost* of the preceding winter, and the heat of the summer, it had lost much of its adhesive property, and was greatly reduced in weight.

I now brought it home, and while one was unloading, another sifted in lime with the hand, (it having been previously slaked to a fine powder,) at the rate of one bushel to a cord of peat. Lime having been thus scattered evenly through the whole mass, nothing further was done to it until about the middle of the next May. Observing, after the manure had been removed from the barn yard, that a considerable quantity of water from the rains had collected itself

the lowest part of the yard, (say six or eight barrels,) I ıd the peat removed into it. The garnet-colored wash of e yard was rapidly and entirely absorbed. I allowed it to main in this situation until the first of June, during which me its color had changed from mahogany to a jet black. ermentation did not take place.

By the successive action of the frost, lime, and the wash of e yard, the sensible qualities of the peat had very much anged. When first taken from the bog, it was pulpy and ry adhesive—could be spread like butter; now it was a ne powder, having entirely lost its peculiar adhesive roperties.

I used the manure thus prepared, for squashes—planting fteen rods of ground, very sandy and much exposed to ought. After the manure had been dropped, (one shovel ll in a hill,) I sprinkled a little lime in each hill, directly on the peat. Upon this, I planted the autumnal marrow uash. The seeds came up well, and the plants were of a althy color. Some of the plants were entirely destroyed, ıd all of them badly eaten by insects; the yellow bug was ost destructive. The plants, after they had recovered from is shock, grew more rapidly than any that I had before itnessed. The color of the vines, and the rapidity with hich they covered the ground, were most convincing proofs my mind that they were perfectly healthy, and well supied with nutriment. In the severe drought which came on the summer, these vines, for many weeks, did not appear suffer, while others of a similar kind in the neighborhood, ere dead and dying. The result was, that notwithstanding e long continuance of the drought, in which nearly all our otatoes, peas, &c. were killed, these squashes were prerved, and yielded a middling crop.

I also used the compost, as above, on intervale land, near e Connecticut river, soil alluvial, no stones or gravel—can e easily compressed, does not bake in the sun—has been ultivated for more than one hundred and fifty years, and ields a very scanty crop, without manure. The compost as spread over the ground, and ploughed in, at the rate of ine cords to the acre of ground; thus prepared, I planted hirty rods with sugar beets—distance between the rows, ighteen inches—hills eight inches—one seed in a hill. he seeds proved bad, not more than one third coming up— et I had 116 bushels of beets; while above an acre of the ame land, manured with the best stable manure, at the rate

of twelve cords to the acre, did not produce one hundred bushels. Two rows of potatoes were planted next the beets; the land had been designed for beets, and was prepared precisely the same. Between these two rows and more than an acre immediately adjoining, (where a larger quantity of best barn-yard or animal manure was used,) there was a very perceptible difference in favor of the former. I also planted a few hills of potatoes on very sandy land, in the latter part of June. Into the hills I put peat, which had been saturated with lye, from the bottom of a soap tub—no lime. The tops of these potatoes, during the whole drought, were of the most living green, and the most luxuriant growth that I ever beheld. They were killed by the frost in the fall, before maturity—the potatoes were small.

In conclusion, I would mention, that I am so well pleased with the result of these experiments on a small scale, that I am now preparing one hundred and fifty cords of peat, and fifty casks of Camden lime, and all the animal manure I can make, to enrich as fast as possible my whole farm.

Expenses. I get out my peat by ox team and cart. Three men can, in this way, get out eight cords per day, $4.00; price of lime, $1.50 per cask. My peat being three and a half miles from my barn, that portion of it which I bring home, I estimate to cost me, for carting, one dollar per cord. The peat and the lime for the compost—using one third of a cask of lime to a cord of peat—then, cost me, on the ground near the peat bog—three cords of peat, $1.50—one cask of lime, $1.50; that which I cart home, $1.00 per cord more.

I intend to put about one-sixth part of animal manure, but as it cannot be purchased in any adequate quantity, it is more difficult to fix a price. The nearest place where livery stable manure is sold, is four miles; price there, per cord, $3.00—cost of carting, $1.50.

Five cords of peat, delivered, - - -	$7.50
Two and one third casks of lime, delivered,	3.50
One cord livery stable manure, " -	4.50
	$15.50—

divided by six—the number of cords, not estimating the increase of quantity from the bulk of the lime—gives the cost, two dollars and fifty-eight cents, delivered—or one dollar and fifty-eight cents per cord, at the peat bog.

(Signed) SAMUEL KEEP.

Dear Sir:—Herewith are the facts, collected with care, at ny request, by my father, Samuel Keep, of Longmeadow. My own opinion is, that a new era has begun in agriculture. The quantity of one third of a cask of lime to a cord, was elected in the absence of chemical experiments, to deternine how much was absolutely needed to neutralize the ilmic acid, because he prefers to put on ten to twelve cords o the acre—and twelve cords would take four casks of lime o the acre. If lime was as cheap as in Maine, he would robably have put in more. Notwithstanding the expense ppears to be great, my father feels confident that he gets a etter article in compost at $2.58, than the livery stables urnish at $3.00, with the additional cost to him of $1.50 for arting, making $4.50. N. C. KEEP.

In order that a plant should absorb the requisite nutricient natters, it is essential that its rootlets should have free play, and hence the necessity of a proper texture in soils. It is also requisite that the materials should be rendered in some degree soluble; and that the soil remain permanently good, t is essential that it should not be too loose in its texture; or, against the opinions of some farmers, I still maintain hat the principal and most active ingredients of manures and soils, are lost by solution and infiltration, the evaporation being as it were but a drop in the bucket. On this point, owever, I shall present some considerations hereafter.

There is also another property of soils too generally lost ight of, namely, their electro motive power, and their nfluence in this manner, upon the absorbing spongioles of the radicles, producing the effect called by M. Dutrochet, *endosmose*, or *internal impulse*. This effect is most assuredly produced by those mixtures and combinations of mineral matters and salts, with vegetable humus, which characterize luxuriant soils. Here, then, is a new field of research for the philosophical farmer, who will find the still small galvanic currents which take place among the particles of soil, are busy preparing his bread. The influence of electricity has long been known to hasten vegetation, and plans will ultimately be adopted to bring the results of the laboratory into the hot bed and green house, while a contemplation of the

phenomena will illustrate those great natural laboratories—the corn-fields of the farmer. A soil consisting of *one kind of earth, is barren*—no matter of what earth it may be composed, whether silex, alumina, lime or gypsum. *Pure vegetable matter, is also barren; but proper combinations or mixtures of three earths, always produce fertility*, provided the *pabulum* or food of the plant be present also. Certain saline matters are said to stimulate plants, and by this I understand that they produce electrical movements or endosmose, for they will act in a similar manner upon dead or inorganic matter, as seen in Dutrochet's experiments. By saline stimulants, the foliage of plants is rapidly and substantially developed, owing to the absorption of carbonic acid gas from the atmosphere, and the retention of its carbon, while the oxigen gas is exhaled by the green leaves. And since such stimuli tend only to the development of the foliage, and act against both germination and ripening, the proper time to apply such substances, is after the plant has shot up, and before it begins to ripen its seeds or fruits.

These principles are generally unknown to farmers, and hence their unskilful application of gypsum, salt, &c., as dressings to soils. They also neglect to consider the native *habitat* of their plants, and hence often apply the wrong stimuli. Now it is evident, that since asparagus plants, onions, cabbages, and similar vegetables, are native plants of the sea-coasts of those countries, to which they are indigenus, that if they are to be cultivated in soils free from saline matter, salt may be advantageously used in small quantities, to render them more luxuriant. Gypsum and sea salt have nearly the same effect upon plants, and hence when the soil derives saline matter from salt-water spray, or vapor, gypsum will not benefit the soil, or act as a stimulant upon plants. This opinion, which is proved in the Prize Essay of Professor Le Cocq, on saline manures, explains the fact, well known in Maine, that gypsum exerts but little action upon the soils near the sea-coast, but does act favorably on the soils of farms situated in the interior of the State, especially on those which contain small quantities of carbonate or geate of lime.

have formerly stated, it is evident from an examina- the mineral ingredients of soils, that they *all origin- rom the decomposition and disintegration of rocks, for ages have been acted upon by air and water;* those having, by their mechanical and chemical powers, d and crumbled the solid ledges into those pulverulent s which form the basis of all soils—to which, subse- y, small quantities of vegetable humus are added by cay of plants.

IENT SOILS. There have been various epochs in the history, when soils were thus formed, and after bearing luxuriant vegetation, were reconverted by aqueous neous causes, into rocks, the structure, and fossil ts of which, denote their origin to have been from ntary matter, hardened by pressure and heat. Thus, we look back to the epoch of the transition formations, d the rocks composing that series to be composed of nerated sand and pebbles, cemented by clay, which ts itself in an indurated form, the result of igneous . Marine shells, contained in the grauwacke rocks scribed, evince that this deposit was chiefly formed h the waters of the sea, while some portions of it were ted in fresh water, as proved by the presence of certain , peculiar to bogs and lakes. The slates of this forma- ontain prints and casts of numerous plants—such as equisetaceæ, lepidodendræ and stigmaricæ; while f anthracite coal, shewing by their structure and com- n their vegetable origin, are also included between the

r it is evident, that the above mentioned plants could ve grown without a soil, and the rocks in which they bedded bear every proof that they were once in that ion.

ONDARY SOILS. We come next to the secondary epoch, re again we are astonished to find proofs of a numerous sion of alternating beds of soil, each having, for long s of time bore their perennial verdure of intertropical , allied to those above noticed, but more complicated

and perfect in their structure. The sandstones and shales of this formation are vast herbariæ of ancient vegetation, and their strata contain, well preserved between their sheets, perfect impressions of numerous genera of plants, the species of which are now extinct. Large trunks of trees are also exposed by opening coal mines and quarries of sandstone, while the numerous and reiterated strata of coal itself also bear ample proofs of their vegetable origin.

Here, then, we have another epoch, at which soils existed, produced their abundant vegetation, stored the earth with fuel, and then were reconverted into solid rocks, to be again subjected to the wear and tear of elemental strife.

The TERTIARY EPOCH was of a milder character, and but little disturbance of the solid rocks appears to have been effected during those submersions, when the plastic clay, calcareous marls and strata of perfectly preserved marine shells, were deposited. These sedementary matters appear to have resulted from a slow and gradual deposition of clay and other fine sedementary matter, which beneath the sea, became soon inhabited by numerous shell fish, and were imbedded in succession as we now find them, since the elevation of the land above the encroachments of the sea.

When we consider the several periods which I have briefly mentioned, it will at once reveal to any reflecting person, that the world has been during the lapse of inconceivable ages, subject to great revolutions in its geological organization. At one time, the rocks are worn down into soils, and bear their vegetation—then continents were sunk in the ocean's depths, and subsequently were raised again, the soils having in the mean time, been converted into rocks. By such considerations, we soon learn to respect the antiquity of the world; and knowing that such records are legibly written on the tablets of stone, we feel a natural desire to read and understand their meaning.

ANCIENT ALLUVIAL SOILS, OR DILUVIUM. Subsequent to the epochs of which I have spoken, we find that another scene of violence disturbed the tranquility of the great deep, and the northern ocean was hurled, with its seas

of ice, over the land, sweeping the loose materials from the very mountain tops, and depositing them far south of their former resting places—while the grooves, scratches and water marks upon the surface of the fixed ledges, shew the direction in which the current passed. By such a flood, (proofs of which are nearly universal in Maine, as elsewhere,) the soils were transported and commingled, so that we rarely find a soil similar to the rocks beneath it, but identical with that derived from other rocks, which occur to the north and northwest. Having already cited so many localities in proof of this position, I shall not here recapitulate, and the intelligent observer will find so many illustrations in Maine, to satisfy his rational curiosity on the subject, that he need not long remain in doubt as to the facts.

Modern alluvial soils. The present causes which act upon the solid rocks, are both chemical and mechanical. Oxigen, from the atmosphere and from water, is constantly effecting some portions of the work, especially where the rocks contain pyrites. Rivers, torrents, brooks, and even rain, are gradually sweeping away the solid rocks, by their continued action; but more powerful than all others, is the action of freezing water, which, by an almost irresistibly expansive force, rends all rocks, into which water can find a passage, and crumbles down those which are porous in their structure. Upon the coast, the sea ever beating the solid rocks and hurling the loose fragments with the force of battering ordnance against the shores, wears away the ledges, the detritus being either spread out on the bottom, or sifted up at the mouths of harbors and estuaries.

Alluvial soils are produced by the transportation of fine particles, by aqueous agency, from higher sources, and are especially brought down and deposited during freshets, when a river bursts its confines, and being diminished in its velocity, deposits its sedementary matter over the intervales. The force of the wind is also constantly removing fine particles of soil from one district to another, and the dust of ages is of greater importance than is commonly believed. Enough has been said on this subject to excite inquiry, and to stimu-

late others to look over the pages of nature, for their own satisfaction, and this is all that can be expected from introductory remarks, such as I now offer to the reflecting observer.

It must not be expected that any one locality is to furnish all the data for the elucidation of a general theory; but a discriminating eye will quickly select such as may bear upon the subject in question. Books, relating the observations and experience of others, should also serve to guide those who may engage in this study.

In order to examine a soil, we must become familiar with the mineral ingredients which enter into the composition of ordinary rocks, and learn to discriminate them, even when masked by a covering or stain from metallic oxides and vegetable humus. By practice, this is easily done, where the particles are distinctly visible to the eye, but when they are reduced to a fine powder, then recourse must be had to the microscope, and to the separation by agitation with water. In the field, there is but little difficulty in ascertaining the mineral ingredients of soils, for there we can always discover some places, where they may be distinctly seen. In case the particles are too small for occular examination, then we must resort at once to chemical tests. In all cases where the quantitative determination of the various ingredients of a soil is undertaken, the work is extremely difficult, and requires a long course of exact experiments, which can only be made in a well furnished laboratory; but it often happens that some more simple question is to be settled, which is all that is required for directing the amendments or cultivation of the farm. Such, for instance, as the presence and quantity of vegetable matters, and of any other of lime. These substances, any ingenious farmer may be able to separate, or at least determine their presence or absence, by which may be sufficient to direct his operations in the cultivation of his farm. A minute analysis, however, is too difficult and complicated a task for any one who is not a professed chemist, having at his disposal delicate balances, crucibles of silver and of platina, with all the other [illegible]

instruments of analysis, and a complete set of all the various reagents and tests, in a state of absolute purity. To furnish such a laboratory, the farmer would have to expend too much money. Considering how seldom he would have to make use of it, he will find it vastly more economical to avail himself of the skill and materials of those who are duly prepared for such operations.

While engaged in the geological survey of the State, I have always considered it my duty to make chemical analyses of such soils as were in any way remarkable, and I shall herewith present some of the results—such as will prove valuable to agriculturists. I shall also describe the method of making a chemical examination of soils, for the purpose of aiding those who may feel desirous of learning the art.

Analysis of soils. We have first to inspect the particles of the soil in question, in order to ascertain its principal mineral components, so as to learn to what class it belongs. The method of doing this has been described in my Second Annual Report. The soil must then be dried, either by the sun's rays, or by spreading it upon paper in a warm and dry room. It is then ready for mechanical separation by seives, as described in the above mentioned Report. Having separated the pebbles, sticks, and coarse particles, we take a portion of the finest powder that passes the gauze seive, and agitate it with water, pour off the suspended particles, and inspect the remainder, to discover the fine mineral components, which may be done easily by means of the microscope. The quantities of matter suspensible and not suspensible in water, is ascertained by drying and weighing the powders collected, on a filter.

The above operations belong to the mechanical separation of the particles, and shed much light upon the nature of the soil.

Chemical analysis. After the above operations, we have to make a chemical analysis; and for this purpose, one hundred grains of the fine powder which passed the gauze seive, is to be weighed out and placed upon a piece of sheet platina, or even upon a quarter of a sheet of letter paper,

and is to be dried at a temperature of 300° F., or not above that point where white paper begins to turn brown by heat. It is then freed from water, and by weighing it a second time, the loss in weight indicates its quantity. (A)

The next operation is intended to determine the quantity of vegetable matter in the soil; and for that purpose, the soil, freed from water,(A) is placed upon a sheet of platina, or in a platina capsule, and introduced into a muffle, or small oven, which is then heated red hot, until all the vegetable matter is burned out of the soil, (the odor while burning may be ascertained by smelting the gas given out by means of a glass tube, placed over the burning soil,) and if animal matter be present, the odor will be similar to that of burning feathers, while the vegetable matter smells like burning peat. After the vegetable and animal matters are burned out, weigh the soil again, and the loss will indicate the quantity of organic matter. (B)

The soil is now ready for the next step, which is to ascertain the quantity of soluble matter it contains. Place it in a thin glass flask, (a clean oil flask will answer,) and pour upon it a sufficiency of distilled water to cover it to the depth of half an inch; then pour in an ounce of pure muriatic acid, and boil it for an hour. Then dilute with water, and filter the solution through a folded double filter of India paper, placed in a glass or wedgewood ware funnel, collect the solution as it drops, in a glass phial or decanting vessel—wash the soil, which is all thrown on the filter, until the water passes tasteless. Remove the filter—dry it, with its contents—then separate the outside filter, and burn the inside one, with the soil which it contains, in the muffle, as before described. Burn also the outside filter, the ashes of which must be weighed and deducted from the burnt soil and filter. (C)

Weigh the insoluble soil, (C) and its loss indicates the soluble matter taken up by the muriatic acid. This serves as a check upon the next operations, and will shew if any matter has escaped detection. The solution which had passed the filter, is now to be returned to the clean flask,

small quantity of nitric acid being added, to convert the oxide of iron into the per-oxide. It is next to be boiled for fifteen minutes, and then pure liquid ammonia is to be added in excess, so as to precipitate all the per-oxide of iron. The whole is now thrown on a double filter, as before, and the per-oxide of iron will remain upon it, while the solution passes the filter, and must be collected, as before described. The per-oxide of iron, and the soluble alumina, are now together upon the filter. Wash with water, until the solution passes tasteless; then dry the filters, separate one from the other, and burn them separately. Weigh one against the other, and the per-oxide of iron and soluble alumina will be obtained. (D). From this, the alumina may be separated by a new attack—or it might have been taken from the iron, before weighing; the former operation being preferable. This operation is done, by melting the alumina and per-oxide of iron in a silver crucible, with thrice its weight of pure potash; then dissolve in water and add more pure potash, until all the alumina is taken up, and the per-oxide of iron remains pure; filter, wash, dry, ignite, and weigh—the loss is the alumina,(E) and the remaining matter is the per-oxide of iron. (F)

The filtered solution, after the separation of the oxide of iron and alumina, is now to be treated for lime, by means of the oxalate of ammonia, and a white precipitate of oxalate of lime will form, if any is present, and may be separated after it has subsided, by filtration. Wash, dry, ignite, to destroy the oxalic acid—add a few drops of a concentrated solution of carbonate of ammonia—heat to dull redness, to expel the carbonate of ammonia in excess, and weigh; this is carbonate of lime. (G)

Now add up the results, and if you have obtained all the components of the soil, and have met with no loss, the sum will be exactly 100 grains. If there is any considerable loss, you must take another portion of the soil, and test it for other substances, and repeat the analysis.

It is seldom necessary to make a thorough analysis of the matters insoluble in acids, since they have not an immediate

influence upon vegetation; but to know the future state of the soil, it must be done. In that case, you must take the dry insoluble soil, grind it to the finest powder—weigh it again, to be sure you have not lost any of it—then mix it with four times its weight of pure carbonate of soda, and melt it in a platina crucible. After fusion, soften it with water, and dissolve the whole of it in dilute muriatic acid. Evaporate to entire dryness, in a glass or porcelain basin—stirring it towards the end of the operation, to prevent spattering; then, when it is entirely dry, moisten it with muriatic acid, and dissolve the soluble muriates in water. Boil—then filter the whole on a double filter, as before; wash it for twenty-four hours with pure hot water—which passing tasteless, remove the filter, dry, separate the two filters, burn one against the other, and weigh; the substance is a pure white powder, and is silica. (h). It ought to be weighed while it is warm, for it absorbs water hygrometrically.

From the filtered solutions, you are now to separate the alumina,(i) per-oxide of iron,(k) and lime,(l) as before described; and if your results balance the amount operated upon, you have obtained all the products. If not, test your solutions for magnesia,(m) manganese,(n) and for potash.(o) Test your alumina also, for phosphoric acid. (p)

Magnesia is detected by means of the phosphate of soda and ammonia solution most readily, with which it forms a white precipitate. Manganese is thrown down by carbonate of soda, from its acid solutions, in the state of a white powder, which becomes brownish black on burning. Potash is tested by means of the solution of hydro-chlorate of platina and soda.

The above is one of the most common analyses of soils, and there are so many operations required, that not more than a dozen analyses could be made in four months, unless we could carry on several at a time, as we are able to do in a regular chemical laboratory.

Beside the above method, we have also to determine the quantity of matter soluble in water, in order to ascertain the soluble salts. For this purpose, take 1000 grains of the dry

soil, and boil it in a glass bottle, with a pint of distilled water; filter, and then evaporate one half of the solution to dryness, and weigh the residue—re-dissolve it, and test the nature of the saline matters. Test, also, the other half of the solution, separate the products, and weigh them separately.

For the discovery of common salt, chloride of sodium, note whether cubic crystals formed in the evaporated solution, which is salt. (q)

To detect the presence of any muriate, use a solution of pure nitrate of silver. If any such salt is present, you will have a thick curdy precipitate of chloride of silver. Collect it, wash, dry and fuse it in a counterbalanced porcelain capsule. Its weight denotes the quantity of muriatic acid, which is 25.36 per cent. of the chloride of silver.—Soluble chloride. (r).

Any sulphate may be detected by the muriate or acetate of barytes, which gives a white precipitate of sulphate of barytes. Collect on a filter, wash, dry, ignite, and weigh. It contains 34.37 per cent. of sulphuric acid, indicating a sulphate of some base. (s)

The presence of any salt of lime, is detected by the solution of oxalate of ammonia, which gives a white cloudy precipitate of the oxalate of lime. Collect, burn, and weigh. You will have the quantity of carbonate of lime. (t)

Potash and all its saline combinations, give a yellow precipitate with the chloride of platina solution. (u)

Nitre is detected by deflagration with charcoal, and by testing the result for potash. (v)

By referring to the letter against each step of the analysis, it will be seen whether the work is complete; and it may then be drawn up thus—the weight of each article being inserted opposite to its name:

(A) Water of absorption.
(B) Organic matter, animal or vegetable.
(C) Insoluble soil.
(D) Per. oxide of iron and alumina.
(E) Alumina—separated.

(f) Per-oxide of iron—separated.
(g) Carbonate of lime.
(h) Silica.
(i) Alumina.
(k) Per-oxide of iron.
(l) Lime.
(m) Magnesia.
(n) Manganese.
(o) Potash.
(p) Phosphoric acid.
(q) Sea salt.
(r) Soluble chloride.
(s) Sulphate of some base.
(t) Soluble salt of lime.
(u) Potash, or any salt of that base.
(v) Nitrate of potash, or nitrate of any alcaline base.

The small letters refer to the operations subsequent to the gross analysis, and are seldom required, excepting for the purpose of detecting the presence of soluble saline matters, as described in another section.

To ascertain the quantity of vegetable matter, soluble in carbonated alcalies or *geine*, the following is the process proposed by Dr. Dana, with some essential modifications. Take one hundred grains of the fine soil, dry it at 300° F., or until paper browns. Then place it in a flask, and pour upon it a solution of fifty grains of carbonate of potash, dissolved in four ounces of distilled water; boil it until it is saturated, then let the soil subside, and pour off the solution upon a filter. Add to the residue a similar alcaline solution, boil again, and pour off in a similar manner upon the same filter. If the last solution was colorless, all the soluble vegetable matter is taken up, and the soil itself may now be washed out and thrown on the filter, and washed with boiling distilled water until it is tasteless. Dry the powder on the filter at 300°, weigh it, and the loss shews the quantity of vegetable matter, soluble in alcaline solutions. Burn the weighed residue, until all the remaining vegetable matter is consumed; weigh again, and the loss is the insoluble vegetable matter.

The solution which has passed the filter, is of the color of port wine, if it contains vegetable matter in solution. Take a portion of it, and neutralize the alcali by nitric acid; then test it with a solution of nitrate of silver. It will give a dense precipitate of a grey color, which turns reddish brown by exposure to light. Treat the alcaline solution with lime-water, in great excess, and you will then throw down a buff colored precipitate of geate, or ulmate of lime. Wash this on the filter, with dilute acetic or muriatic acid, and you will remove the lime, and pure geine, or ulmic acid will remain.

The insoluble matter on the first filter, may now be analyzed for its mineral elements, in the usual manner; but the salts will have been converted into carbonates. Thus, if gypsum was present, it will be found converted into carbonate of lime.

The above process, suggested principally by Dr. S. Dana, was used by Professor Hitchcock, in the analysis of the soils of Massachusetts. It is a good method for the purpose above indicated, but the varying quality of the vegetable and animal matters is not fully shown by it, nor by any other ordinary method, the process by the deut-oxide of copper being requisite for the analysis of highly manured soils. In Maine, however, we have mostly vegetable matters to deal with, as the organic ingredients in soils, and this process is, therefore, applicable, and has been used by me in several analyses, as above modified.

Dr. Dana suggested the occurrence of sub-phosphate of alumina in soils, and I found in one instance three per cent. of this matter in a soil from Wilton. It is highly probable that it has been overlooked by chemists, since it so closely resembles pure alumina, and precipitates with it.

According to the above described processes, we have analyzed numerous soils from Maine, the results being given below, and again resumed, in a tabular form, at the end of the Report.

Soil from the farm of Mr. J. McCully, of Wilton. It is a yellow loam, derived from the decomposition of argilla-

ceous and mica slate rocks, particles of which are visible in the soil, especially after the fine parts are removed by agitation with water. This soil produced, last year, forty-eight bushels of wheat to the acre, according to the statement of Mr. McCully. Mechanical separation, by two seives, one of which has meshes one-tenth inch in diameter, and the other is of the finest gauze:

Remains on 1st seive, vegetable fibres, pebbles of slate and quartz, - - -	175	grains.
" " 2d seive, fine sand and veg. fibres,	162	"
Passes last seive, very fine yellow powder,	663	"
	1000	

Chemical analysis of 100 grains of the soil, gives:

Water, - - - - -	5.0	grains.
Soluble vegetable matter, - -	12.0	or geine.
Insoluble, - - - - - -	5.5	
Silica, - - - - -	54.2	
Alumina, - - - - -	10.6	
Sub-phosphate of alumina, - -	3.0	
Per-oxide of iron, - - -	7.0	
Oxide of manganese, - - -	1.0	
Carbonate of lime - - -	1.5	
	99.8	
	.2	loss.

Although this soil now produces heavy crops, it will soon become exhausted, unless it is treated with lime. It is rich in vegetable matter, and skilfully treated, will continue fertile without any other manure than above noted.

Soil from the farm of Mr. Harding, Union, produced forty bushels of wheat to the acre, last year—now laid down to grass. It is a brownish yellow loam, containing pebbles of granite and quartz, with vegetable fibres undecomposed.

Remains on 1st seive,	43	grains pebbles.
" " 2d seive,	60	granitic sand and roots of grass
Fine powder from the last seive, -	897	
	1000	

Chemical analysis :—100 grains, treated as usual, gave:

Water of absorption, - - -	4.6
Vegetable matter, - - - -	8.2
Per-oxide of iron and alumina, - -	9.8
Insoluble granitic soil, - - -	73.2
Carbonate of lime, - - - -	4.2
	100.0

This soil is rich in carbonate of lime, and effervesces with acids very distinctly. It is a good soil for grain, and will endure well. The vegetable matter may be replenished by compost manure, made with peat, when more is needed. The quantity of lime is unusually great in this soil, and was probably derived from the adjacent limestone beds.

Soil from the farm of Mr. L. Levensaler, of Thomaston. This soil is a yellow loam, derived from the decomposition of micaceous and talcose slate. It was dressed with twelve loads of manure to the acre, and had upon it a luxuriant crop of wheat.

Mechanical separation of the ingredients:

1st seive, pebbles of talcose slate, &c. -	271
2d seive, vegetable fibre and sand, -	231
Very fine powder from last seive, - -	498
	1000

Chemical analysis of 100 grains of the fine powder:

Water, - - - - - - -	7.7
Vegetable matter, - - - - -	8.0
Per-oxide of iron and alumina, - -	11.2
Insoluble, - - - - -	69.2
Carbonate of lime, - - - -	2.0
	98.1
Carbonate of magnesia, not separated,	1.9 by loss.
	100.0

This is evidently a good soil, although more loose in its texture than is advantageous for retaining manures.

Muscle mud, which is composed chiefly of clay and lime, being attainable, may be advantageously used, when the soil needs amelioration. It contains enough carbonate of lime to produce visible effervescence with acids.

THOMASTON. *Soil taken from the Beechwoods, north of the West Thomaston lime quarries.* This soil was selected from the midst of the grove, where it had never been cultivated. Its chemical composition is as follows:

Water of absorption, - - - -	4.2
Vegetable matter, - - - - -	13.8
Insoluble soil, - - - -	68.9
Per-oxide of iron, - - - -	12.9
Carbonate of lime, - - - -	0.2
	100.0

From the small proportion of lime in this soil, it will evidently, when cultivated, require an addition of it to render the soil suitable for wheat. It is an interesting and curious fact, that the soils of Thomaston, so celebrated for its lime quarries, should be wanting in lime.

Soil taken from the north side of the Meadow quarries, gives :—

Water, - - - - - -	7.0
Vegetable matter, - - - -	8.0
Insoluble soil, - - - - -	76.3
Per-oxide iron, - - - - -	7.5
Carbonate of lime, - - - -	1.0
	99.8

Soil from the farm of Dr. Burleigh, of Dexter. This soil is of a dark brownish yellow color, and bears luxuriant crops of oats. In some parts of the field, patches are observed where the oats are very tall and heavy, so that, while its general average height in the field is but two feet, some spots had stalks four feet high and of great fulness. Specimens were, therefore, selected from the different places, and herewith are presented the results of the analysis. That

where the oats were of ordinary size gives, on mechanical separation:

1st seive, slate and quartz pebbles, - -	137
2d " fine sand, - - - - - -	166
Fine powder, - - - - - - -	697
	1000

Chemical analysis of 100 grains of the fine powder:

Water, - - - - - -	5.4
Vegetable matter, - - - - -	8.6
Per-oxide of iron and alumina, -	7.0
Insoluble soil, silicious, - -	76.9
Carbonate of lime, - - -	1.8
	99.7
	1.3 loss.
	100.0

On the most fertile spots, the soil is composed as follows:

1st seive, quartz and slate pebbles, - -	20
2d " fine straws, and fibres with sand,	36
Fine powder, - - - - - -	944
	1000

Chemical analysis of 100 grains of the fine powder:

Water, - - - - - - -	3.4
Vegetable matter, - - - - -	7.7
Oxide iron, - - - - - -	2.3
Insoluble silicious residue, - -	83.7
Carbonate of lime, - - - - -	2.9
	100.0

From these analyses, it will appear that a finer texture of the soil, accompanied by a larger proportion of lime, produced the augmented degree of fertility; and it also shews that this takes place where there is even a less proportion of vegetable matter—this instance proving decisively that lime is the best fertilizer to the soil.

Soils from Dr. Bates' farm, Norridgewock. The soils were taken from the following tracts upon a table-land plain;

near the Kennebec river. First, from the uncultivated plain, then covered with short grass; second, from the field upon which a luxuriant crop of oats and peas was growing; third, from the wheat field; the above localities being contiguous to each other, and forming a part of a uniform plain.

1st—pebbles and sticks, - - - -	50
2d—fine roots of grass and sand, - -	350
Third, fine powder, - - - - -	600
	1000

Chemical analysis of 100 grains of the fine soil—No. 1:

Water, - - - - - -	4.8
Vegetable matter, - - - -	10.2
Oxide iron, - - - - - -	6.8
Insoluble matter, - - - - -	77.1
Carbonate of lime, - - - -	0.9
	99.8
	.2 loss.
	100.0

Analysis of No. 2:

Pebbles and straws, - - - -	27
Fine gravelly sand and roots of grass,	276
Fine soil, - - - - - -	697
	1000

Chemical analysis of 100 grains of the fine soil:

Water, - - - - - - -	5.5
Vegetable matter, - - - - -	7.4
Oxide of iron, - - - - -	5.8
Insoluble, - - - - - -	79.3
Carbonate lime, - - - - -	1.6
	99.6
	0.4 loss.
	100.0

Specimen 3d, from the wheat field. Mechanical separation:—

1st—gravel and straws, - - -	46
2d—sand and straws, - - - -	242
Fine powder, - - - - -	712
	1000

The increased quantity of lime in the cultivated field, may : owing to a top dressing of lime having been used. he soil is of good quality, but needs more lime. The heat looked very well, excepting where the weavel had tacked it. Some of the ears were smutty, apparently from e action of a small worm in the stalk of the wheat.

Analysis of soil from the farm of B. Bryant, Esq., of nson. This soil produces forty bushels of wheat to the :re, and has been cultivated for several years, barn yard anures having been used for dressing. Mr. Bryant informed e that he had never dressed it with lime, and since it does ntain a large proportion of that substance, it must either ive been naturally in the soil, or was introduced in the rm of stable manure. Considering the large proportion hich it bears, the latter could hardly have been the case; id it is more probable that the lime was derived from those cks which produced the soil by their decomposition. The il is of a dark brown yellow color, and of good texture, eing composed of mechanical parts:

1st—grass and stones, - - -	11
2d—sand and stones, - - -	190
Fine loam, - - - - - -	799
	1000

100 grains of the fine powder contain:

Water, - - - - - - -	7.6
Vegetable matter, - - - -	5.6
Per-oxide of iron, - - - -	6.1
Carbonate lime, - - - -	4.6
Insoluble, - - - - -	75.0
	98.9
	1.1 loss.
	100.0

Soil from an uncultivated field, belonging to J. Ham, Esq. Bangor:—

1st—small gravel, - - -	4
2d—sand, - - - - -	10
Fine powder, - - - -	986
	1000

Chemical analysis of 100 grains:

Water, - - - - - -	4.9
Vegetable matter, - - - -	6.7
Insoluble soil, - - - -	74.6
Ox. iron and alumina, - - -	11.5
Carb. lime, - - - - -	1.2
	98.9
	1.1 loss.
	100.0

This analysis was requested, in order to ascertain if the soil contained a sufficiency of vegetable matter, since more could be added to it easily from a neighboring peat bog. It contains a sufficiency for the nourishment of several crops, but a compost of lime and peat, as I have recommended, will make it more fertile. It will also form a good covering to the peat bog, in case it is desirable to convert it into a meadow.

Soil from the corn field of Mr. E. C. Belcher, Farmington. This field has been cultivated for thirty years, and generally gives a good crop of Indian corn. It is a yellow and loose loam, composed of the following mechanical parts:

1st—pebbles and straws, - - -	26
2d—sand, - - - - - -	430
Fine loam, - - - - -	544
	1000

ıemical analysis of 100 grains of the fine soil :

Water, - - - - - -	5.9
Vegetable matter, - - - -	8.5
Per-oxide of iron and alumina, - -	7.8
Insoluble matter, - - - -	75.9
Carbonate of lime, - - - -	0.8
	98.9
	1.1 loss.
	100.0

ɔil *from the field of Mr. Foster, Avon.* This soil is light yellow color, is of granitic origin, and bears good s of corn.

echanical separation :

1st—granite pebbles and sticks, - -	69
2d—sand, - - - - - -	338
Fine powder, - - - - -	593
	1000

hemical analysis of 100 grains of the fine powder :

Water, - - - - - -	4.4
Vegetable matter, - - -	8.5
Insoluble granitic sand, - - -	76.0
Oxide of iron and alumina, - -	9.7
Carbonate of lime, - - - -	0.3
	98.9
	1.1 loss.
	100.0

ɪɴғɪᴇʟᴅ. *Soil from Col. Morrill's farm.* Grass, grain,

echanical separation :

No. 1. Pebbles and straws, - -	7
No. 2. Fine gravel and vegetable fibres,	36
Fine soil, - - - - - -	957
	1000

Chemical analysis of 100 grains fine soil:

Water, - - - - - -	3.2
Vegetable matter, - - - -	7.1
Per-oxide of iron, - - - -	5.4
Carbonate of lime, - - - -	0.4
Insoluble matter, - - - -	82.8
	98.9
Loss, - - - -	1.1
	100.0

RUMFORD. *Mr. Wood's farm.* Soil dark brown yellow; crop Indian corn, one hundred bushels (ears?) to the acre.

Mechanical separation:

No. 1. Granite pebbles, - - -	48
No. 2. Sand, - - - - -	208
Fine soil, - - - - -	744
	1000

Chemical analysis of 100 grains:

Water, - - - - - -	5.7
Vegetable matter, - - - -	8.8
Oxide of iron, - - - - -	6.0
Carbonate of lime, - - - -	0.7
Insoluble matter, granitic sand, -	77.1
	98.3
Loss, - - - -	1.7
	100.0

ORRINGTON. Light yellow loam, with a heavy crop of wheat growing upon it.

Mechanical separation:

No. 1, Pebbles, - - - -	19
No. 2. Sand and vegetable fibre, -	125
Fine loam, - - - - - -	856
	1000

hemical analysis:

Water, - - - - - - -	3.8
Vegetable matter, - - - -	4.9
Insoluble " - - - -	81.8
Per-ox. iron and alumina, - - -	8.3
Carbonate of lime, - - - -	0.3
	99.1
	.9 loss.
	100.0

INTON. *Soil from farm of Mr. Burrill*, bears a good of corn.

echanical separation:

No. 1. Gravel and vegetable fibres, -	3
No. 2. Sand and " " -	122
Fine loam, - - - - - -	875
	1000

hemical analysis of 100 grains fine soil:

Water, - - - - - - -	4.3
Vegetable matter, - - - -	11.1
Insoluble " - - - -	78.1
Per-ox. iron and alumina, - - -	6.4
Carbonate of lime, - - - -	0.1
	100.0

ETHEL. *Soil from the farm of I. Haynes, Esq.*, bears bushels of corn to the acre. Has been dressed with yard manure. The soil is of a brown color, and was ved from granitic rocks.

echanical separation:

No. 1. Granite pebbles, and sticks, -	20
No. 2. Fine gravel and vegetable fibres,	230
Fine soil, - - - - - -	750
	1000

Chemical analysis on 100 grains:

Water, - - - - - -	4.3
Vegetable matter, - - - -	8.7
Insoluble granitic sand, - - -	79.6
Per-oxide of iron, - - - -	4.4
Carbonate of lime, - - - -	2.3
	99.3
Loss, - - - -	.7
	100.0

This soil will evidently produce good crops of wheat, since it contains the requisite ingredients for such a crop.

ALNA. *Soil taken from amid a white maple grove.* It is a reddish brown colored loam.

Mechanical separation:

1st seive, gravel, - - - -	30
2d " sand and vegetable fibre, -	254
3d " fine loam, - - - -	716
	1000

Chemical analysis on 100 grains:

Water, - - - - - -	6.3
Vegetable matter, - - - -	10.2
Insoluble micaceous sand, - -	74.7
Ox. iron and alumina, - - -	6.3
Carbonate of lime, - - -	0.7
	98.2
Loss, - - - -	1.8
	100.0

WARREN. *Soil from the farm of Mr. Fish,* bears a goo crop of wheat. This soil is of granitic origin, and contain

No. 1. Pebbles of granite and slate, -	52
No. 2. Fine particles of the same, - -	127
Fine soil, - - - - - -	821
	1000

100 grains analyzed, give:

Water, - - - - - -	8.2
Vegetable matter, - - - -	6.6
Insoluble granite sand, - - -	74.9
Per-oxide iron, - - - - -	8.6
Carbonate of lime, - - - -	0.8
	99.1
Loss, - - - - -	.9
	100.0

This soil needs more lime and vegetable compost.

Sebec Village. Soil brown yellow, derived from slate rocks. Bears a good crop of wheat.

Mechanical separation:

No. 1. Slate, - - - - -	78
No. 2. Smaller particles, - -	155
No. 3. Fine loam, - - - - -	767
	1000

Chemical analysis of 100 grains:

Water, - - - - - -	4.0
Vegetable matter, - - - -	10.3
Insoluble slaty particles, - -	76.8
Per-oxide iron, - - - - -	7.4
Carbonate of lime, - - - -	0.9
	99.4

Foxcroft. *Soil from the farm of Mr. W. S. Mayhew*—good crop of wheat. Soil granitic, brown yellow.

Its particles separated, gave:

No. 1. Granite pebbles and straws,	103
No. 2. Finer sand, - - - - -	200
Fine soil, - - - - - -	697
	1000

Chemical analysis of 100 grains:

Water, - - - - -	6.5
Vegetable matter, - - - -	12.9
Insoluble soil, - - - -	71.5
Per-ox. iron, - - - -	7.0
Carbonate lime, - - - -	1.0
	98.9
Loss, - - - -	1.1
	100.0

GUILFORD. *Soil from farm of J. Kelsey, Esq.*, bears a good crop of oats. Soil light brown.

Mechanical separation:

No. 1. Gravel, - - - -	52
No. 2. Sand, - - - -	76
Fine soil, - - - - -	872
	1000

Chemical analysis:

Water, - - - - - -	6.4
Vegetable matter, - - -	11.4
Insoluble soil, - - - -	70.8
Oxide iron, - - - - - -	10.3
Carbonate lime, - - - -	0.3
	99.2

DOVER. *Farm of Mr. Stephens.* Soil brown yellow—bears a good crop of wheat.

No. 1. Pebbles and grass roots, -	54
No. 2. Sand, - - - -	206
No. 3. Fine loam, - - - -	740
	1000

hemical analysis:

Water, - - - - - -	6.6
Vegetable matter, - - -	11.1
Insoluble soil, - - - -	71.1
Per-oxide of iron, - - -	9.3
Carbonate of lime, - - -	0.8
	98.9
Loss, - - - -	1.1
	100.0

INOT. *Soil from farm of S. Stetson.* Corn and Wheat s said to be good.

lechanical separation:

No. 1. Dry grass roots, - - -	3
No. 2. Sand, - - - -	76
Fine loam, - - - - -	921
	1000

hemical analysis of 100 grains:

Water, - - - - - - -	4.3
Vegetable matter, - - -	4.9
Insoluble soil, - - - -	83.7
Oxide of iron, - - - -	5.9
Carbonate of lime, - - -	0.5
	99.3
Loss, - - - -	.7
	100.0

VERMORE. *Soil from the farm of Mr. J. Washburn.* er, two tons to the acre. Soil, dark greyish yellow.

Pebbles and grass, - - - -	57
Sand and " - - - - -	136
Fine loam, - - - - -	807
	1000

Its chemical composition is, on 100 grains:

Water of absorption,	4.0
Vegetable matter,	[illegible]
Insoluble soil,	[illegible]
Oxide iron,	7.3
Carbonate of lime,	0.7
	99.4
Loss,	.6
	100.0

GLENBURN. *Soil from farm of Mr. Sears.* Wheat [illegible] good. Soil yellowish grey.

No. 1. Pebbles,	250
No. 2. Sand,	237
Fine soil,	513
	1000

Water,	5.7
Vegetable matter,	6.3
Insoluble,	77.8
Oxide of iron,	8.5
Carbonate of lime,	0.7
	99.0

ACTION OF ALCALIES ON SOILS—BURNING OF SOILS, &c. Potash renders most of the vegetable humus soluble in water; consequently it produces a very marked and powerful effect, rendering vegetation for a while extremely luxuriant; but the evils that follow from a too free use of this substance, are very great, for the soil is in a few years deprived of its vegetable matter, and is rendered barren. Hence, it is absolutely necessary, if you make free use of ashes in the amendment of soils, that a constant supply of vegetable matter should be introduced into it, to furnish an unfailing supply of nutriment to the plants. Neglience of this principle, will surely convert the farm dressed in this manner

nto a barren waste, and every farmer ought to be well nformed on this point. By knowing and attending to the ule here laid down, the agriculturist may avoid those difficulties which I find are so prevalent in Maine and New-Hampshire, where ashes is used in the treatment of soils. On the sandy soil of Long Island, New-York, the farmers know that they must put in a large quantity of compost with their ashes, and sea and rock weeds are the most accessible sources of vegetable manure which they have at command. Spent ashes acts also by the quantity of lime it contains, and the principal advantage of using it in preference to lime alone, in the treatment of sandy soils, depends upon the clayey nature of the ashes itself, which serves to improve the texture of the soil and retains the manures and water longer than it otherwise would.

Much discussion has arisen among farmers, as to the operation and advantages of burning the surface of the soil. The same principles, above enunciated, also explain this operation. It is true that a vast quantity of vegetable humus is destroyed by burning; but at the same time potash is formed by the combustion of wood, which acts as a fertilizer, for it dissolves the vegetable matter, and causes the vegetation to become more luxuriant. The potash also decomposes some of the mineral constituents in the earth, and saturates acid salts decomposing the sulphate of iron and converting it into a harmless substance. There can be no doubt, however, that a burnt soil soon runs out or becomes barren, and this fact is readily explained by the circumstance before mentioned—that is, the conversion of the humus into soluble matter, so that it is soon lost by infiltration. There is, however, no other method so convenient for the clearing away the forest trees, while preparing a farm in the wilderness; and if the farmer will take the trouble to restore the vegetable matter which he has lost in the soil, either by putting in compost, as directed in the foregoing pages, or by turning in the sod, after raising two crops upon his field, he will overcome the difficulty and retain the original luxuriance of his farm. The system that has been heretofore followed, would soon

render the State a barren waste; and it is earnestly hoped, that our admonitions may be duly improved.

Ground bones have long been used in Europe as manure, with the happiest effects, and several years since I had occasion to call public attention to the vast amount of such matter thrown away in our large cities. The quantity of bones rejected from the soap works in Boston was immense, and those establishments were put to considerable trouble and expense to have them carted to some convenient place for throwing them into the sea. Since that time, there has been quite an important commerce carried on in the article of bones, and a mill has been erected at Roxbury, for grinding them into powder for manure.

In answer to queries proposed by me, Mr. Nahum Ward has furnished me with the following statistics of his business:

"I grind three or four hundred tons of bones per annum.

"I obtain them in Boston and vicinity.

"They cost me eight dollars per ton, delivered at the mill in Roxbury.

"Ground bones sell at thirty-five cents per bushel.

"The mill cost from five to six thousand dollars."

A similar establishment is maintained in New-York, and in both places the business is said to be profitable, there being a ready demand for the article. It acts as a permanent ameliorator of the soil, the animal matter doubtless undergoing putrefaction, and is rendered soluble, while the phosphate and carbonate of lime are also gradually taken up by the plants, but very slowly, since those substances are nearly insoluble in water.

If bones are burned or charred by fire, they may be easily ground in a common grist mill, or may be crushed by the rolling mill, used by tanners. In this state, the bone still preserves all its mineral and some of its animal matter, and will act as a powerful fertilizer, when placed on any soil. It is to be used for a top dressing.

Ground oyster shells are also useful, as a manure, and there is a bed of half disintegrated shells on the sea-coast, at Newcastle, in this State, where that substance may be

readily prepared. The shells may be transported to the Plaster Mills of Waldoborough, and there be ground and packed in casks for sale.

Refuse bone, black from the sugar refineries, is also a very powerful manure, and is extensively used in France, and the sugar refiners send their ships to this country, and to all parts of the world, to obtain bones, which they use, first for decoloring sugar, and then sell the exhausted bone black for manure.

Maple sugar. The Acer Saccharinum, or sugar maple, is one of the most luxuriant and beautiful native forest trees in Maine, and abounds wherever the soil is of good quality. Its ascending sap is very rich in sugar, which is readily obtained by means of a tap, bored with an auger, half an inch in diameter, into the sap wood of the tree; the sap being collected in the spring of the year, when it first begins to ascend, and before the foliage puts forth. It is customary to heap snow around the roots or stumps of the trees, to prevent their putting forth their leaves so soon as they otherwise would, for the juices of the tree begin to be elaborated as soon as the foliage is developed, and will not run.

After obtaining a quantity of maple sap, it is poured into large iron or tinned copper kettles, and boiled down to a thick syrup; and after ascertaining that it is sufficiently concentrated to crystalize or grain, it is thrown into casks or vats, and when the sugar has formed, the molasses is drained off through a plug hole, slightly obstructed by tow. But little art is used in clarifying the syrup, and the chemist would regard the operations as very rude and clumsy; yet a very pleasant sugar, with a slightly acid taste, is made, and the molasses is of excellent flavor, and is largely used during the summer, for making sweetened water, which is a wholesome and delicious beverage.

The sugar frequently contains oxide of iron, which it dissolves from the rusty potash kettles, in which it is commonly boiled down, and hence it turns tea black. A neat manufacturer will always take care to scour out his kettles with vinegar and sand, so that the sugar may be white. He will

also take care not to burn the syrup, by urging the fire towards the end of the operation. If his syrup is acid, a little clear lime water will saturate it, and the lime will principally separate with the molasses, or with the scum. The syrup should be skimmed carefully during the operation. It is not worth while, perhaps, to describe the process of refining sugar; but it is perfectly easy to make maple sugar as white as the best double refined loaf sugar of commerce. It would, however, lose its peculiar acid flavor, which now distinguishes it from ordinary cane sugar.

Were it generally known how productive are the groves of sugar maples, we should, I doubt not, be more careful, and not exterminate them from the forest, as is now too frequently done. It is, however, difficult to spare any forest trees, in clearing a farm by fire, but groves in which they abound, might be spared from the unrelenting axe of the woodman. Maple trees may also be cultivated, and will become productive in twenty or thirty years; and it would certainly be one of our most beautiful pledges of regard for posterity to plant groups of maples in convenient situations, upon our lands, and to line the road sides with them. I am sure that such a plan, if carried into effect, would please public *taste*, in more ways than one, and we might be in part disfranchised from dependence on the cane plantations of the West Indies.

The following statistics will serve as an example of the products of the sugar maple in Maine, and it will also be noted that the whole work of making maple sugar is completed in *three* or *four* weeks from the commencement of operations.

		lbs. of sugar.
At the Forks of the Kennebec, twelve persons made,		3,650
On No. 1, 2d Range, one man and boy	"	1,000
In Farmington, Mr. Titcomb	"	1,500
" Moscow, thirty families	"	10,500
" Bingham, twenty-five families	"	9,000
" Concord, thirty families	"	11,000
Pounds of sugar,	- - - -	36,650

This, at twelve and a half cents a pound, would be worth $4,581.

must be also remarked, that the manufacture of maple ' is carried on at a season of the year when there is else to be done, and if properly shaped evaporating ls were used, a much larger quantity of sugar could be : in the season.

gar may also be advantageously manufactured in Maine, the beet, as is done in France. The wide-spread inter- of the Aroostook, above the entrance of the St. Croix, well adapted for such crops; and I am informed by rienced farmers, that the season will there be amply enough for the growth and maturity of the sugar beet, the north of France. Information respecting the man- ture of beet sugar, and the value of the crops, may be d in Chaptal's Agricultural Chemistry, and the improved esses may be learned from the various agricultural rs, published periodically. The value of the sugar beet, eeding cattle and swine, is very great; and where it is ised for that purpose, the pulp may be easily made into se wrapping paper, either bleached or colored. I would e the attention of the farmers of Maine, to this important rtment of agriculture, and request the statistical results leir experience.

Tabular view of the Analyses of Soils collected and analyzed in 1838.

No	LOCATION.	Crops, &c.	Water, pr. cent.	Veg. matter, pr cent.	Soluble Soil, pr. ct.	Insoluble soil, pr. ct.	Oxide Iron, per cent.	Carb. Lime per cent.	Magnesia, per cent.	Manganese. pr. ct	Mechanical Analysis on 1000 grains. Course, did not pass the 1st sieve. No. 1.	Sand, &c. did not pass the 2d sieve. No. 2.	Fine Loam. No. 3.
1	Albany.	Sugar maples—heavy growth.	6.3	10.2	16.2	74.7	6.3	0.7			60*	254	686
2	Anson—B. Bryant.	Wheat—good—soil dark brownish yellow—effervesces briskly with acids.	7.6	5.6	17.4	75.0	6.1	4.6			11	90	899
3	Avon—J. Foster.	Corn—good—soil light brown.	4.4	8.5	19.6	76.0	9.7	0.3			69†	338	407
4	Bangor—J. Ham.	Uncultivated—soil yellow.	4.9	6.7	20.5	74.6	11.5	1.2			4	10	986
5	Bethel—I. Haines.	Corn—40 bushels to acre—dressed with barn manure—soil brownish.	4.3	8.7	16.1	79.6	4.4	2.3			20†	230	750
6	Brewer—T. Barstow.	Wheat—luxuriant—dressed with lime—soil, clay loam, yellowish grey.	4.1	7.9	14.1	77.7	7.6	1.0			3	36	961
7	Canada Road—8 miles from Bingham.	Mixture of hard and soft growth of wood—soil light brownish yellow.	5.6	6.0	17.9	76.3	9.1	0.4			198‡	117	685
8	Clinton—Mr. Burrells.	Corn—good—light brownish yellow.	4.3	11.1	16.8	78.9	6.4	0.1			3	22	975
9	Dexter—Dr. Burleigh.	Oats—luxuriant—soil, dark yellow.	5.4	8.6	13.7	76.9	7.0	1.8			137§	166	697
10	" " "	Oats—4 feet high—soil only in spots, greyish white.	3.4	7.7	12.9	83.7	2.3	2.9			20§	36	944

11	" Mr. Green.	Wheat—good—soil, light brownish yellow.	4.6	10.2	12.9	72.5	10.1	1.0		73	174	753
12	Dixfield—Col. Morrill's	Oats—100 bushels to acre—soil light brownish yellow.	3.2	7.1	14.5	82.8	5.4	0.4		7	36	957
13	Dresden.	Clover and herds-grass—1½ tons to the acre.	3.8	7.6	19.2	77.0	8.7	2.5		18	131	851
14	Farmington—E. C. Belcher.	Corn—good—cultivated for corn 30 yrs. —soil brownish yellow.	5.9	8.5	18.4	75.9	7.8	0.8		26	430	544
15	Foxcroft—Mr. Stevens	Wheat—good—light brownish yellow.	6.6	11.1	22.3	71.1	9.3	0.8		54	206	740
16	" W.S.Mahew	Wheat—good—soil brownish yellow.	5.5	13.9	22.8	71.5	7.0	1.0		103	200	697
17	Glenburn—Mr. Sears.	Wheat—good—soil yellowish gray.	5.7	6.3	15.8	77.8	8.5	0.7		250	237	513
18	Guilford—J. Kelsey.	Oats—good—light brownish yellow.	6.4	11.4	25.4	70.8	10.3	0.3		52	76	872
19	Kingfield—Gen. King's	Uncultivated—soil yellow.	4.6	5.9	15.3	89.2	8.6	0.8		267	223	510
20	Livermore—J. Washburn.	Clover—2 tons per acre—soil dark yellowish grey.	4.0	9.3	17.3	78.1	7.3	0.7		57	136	807
21	Livermore—O. Pray.	Wheat—30 bush. to acre—soil yellowish grey.	3.4	8.0	15.6	79.1	7.3	0.3		128	135	737

[illegible] and mica slate. † Granite. ‡ Granite, slate and hornstone. § Slate and quartz.

Tabular view of the Analyses of Soils collected and analyzed in 1838.

No	LOCATION.	Crops, &c.	Water, pr cent	Veg. matter, pr cent	Soluble soil, pr. ct.	Insoluble soil, pr ct	Oxide Iron, per cent.	Carb. Lime, per cent	Magnesia, per cent	Manganese, pr. ct	Sulphuric Acid, pr. ct	Alumina	Mechanical Analysis on 1000 grs. Coarse, did not pass the 1st sieve. No. 1.	Sand, &c. did not pass the 2d sieve. No. 2.	Fine Loam No. 3.
22	Minot—E. Stetson.	Corn and wheat—good—soil dark brownish yellow.	4.3	4.9	11.3	83.7	5.9	0.5					3	76	921
	Norridgewock—Doctor Bates's Plain.	Uncultivated.	4.8	10.2	17.9	77.1	6.8	0.9					50	350	600
24	" " " "	Oats and peas—good—soil brownish yellow, sandy.	5.5	7.4	14.8	79.3	5.8	1.6					27	276	697
25	Orrington.	Wheat—good—soil light yellow loam.	3.8	4.9	13.5	81.8	8.3	0.3					19	125	856
26	Rumford—Mr. Wood.	Corn—100 bush. to acre—dark brownish yellow.	5.7	8.8	15.4	77.1	6.0	0.7					48	208	744
27	Saco—I. Jordan.	Greenish—containing copperas.	13.5		13.9	54.7	11.2	2.7		0.6	9.8				
28	Sebec—Mr. Chandler.	Wheat—good—soil light brownish yellow.	4.0	10.3	18.6	76.8	7.4	0.9					134‡	143	723
29	Sebec Village.	Wheat—good—soil brownish yellow.	4.1	11.5	15.1	73.7	0.3	0.6					78	155	767
30	Thomaston—North of Lime Quarries.	Wheat—good.	7.0	8.0	16.5	76.3	7.5	1.0							

32	Thomaston—North of Lime Quarries.	Uncultivated—beech growth of wood.	4.2	13.8	26.	65.9	12.9	0.2					360	268	372
33	Union—Mr. Harding.	Corn—40 bush. to acre—brownish yellow—slight effervesence with acid.	4.6	8.2	22.2	73.2	9.8	4.2					43	60	897
34	Warren—Mr. Fish.	Wheat—good—yellow.	8.2	16.6	25.6	74.9	8.6	0.8					52	127	821
35	Wilton—J. McCully.	Wheat—45 bushels to acre—brownish yellow.	5.0	12.0	28.0	5.5	7.0	1.5*	3.0†	1.0		10.6			

* Phosphate Lime. † Sub Phosphate of Alumina. ‡ Slate.

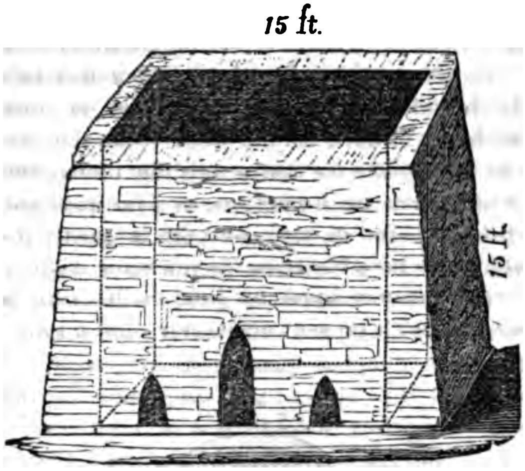
REMARKS ON LIMESTONES.

A tabular view of the chemical composition of each variety of limestone, analyzed in my laboratory during the present year, is herewith subjoined. From this table, it is easy to fix the relative values of each kind of rock, and to learn how they will burn in the kiln. Many of them will bear the heat requisite for converting them into lime, by the discharge of the carbonic acid gas, at a full red heat; others must be burned more slowly and with a gently increasing fire, which may be ultimately driven to a dull or cherry redness. All those marked as good, will slake perfectly, after being burned, and are sufficiently pure for all ordinary uses. They are generally free from magnesia, and hence are better adapted to agricultural use, than the magnesian limestones. Magnesia will remain a long time exposed without absorbing its equivalent of carbonic acid, and thus it does not act favorably, excepting when thoroughly saturated by the fermentation of compost, or by long exposure to the air. When such limestones are skilfully managed, they answer nearly as well as the pure lime. The argillaceous matter, contained in some of the limestones, that occur imbedded in slate rocks, does no harm to the soil, and is even beneficial in some cases. The Dexter and Guilford limestones will make a good and strong mortar, and will also prove very valuable in making compost, or for the treatment of soils by liming. So will also many of the other varieties hereafter mentioned in the tables.

Under the description of each locality, I have made ample observations on the nature of the lime-rock, and shall here present some views or plans of such kilns as may be required for the conversion of the rocks into quicklime.

Fig. 1st. Kiln built of refractory rocks, lined with clay, and laid outside with mortar—fifteen feet wide—fifteen feet high—five feet back. Arches—middle, five feet high—side arches, three and a half feet high.

FIG. I.



Lime Kiln for burning 300 casks of lime at a time.

This kiln is of the form commonly used at Thomaston, and the lime is burned by means of wood fuel—thirty cords of wood being required to burn the charge of rock. The operations are divided into four turns, and from three to four days and nights the fire is kept unremittingly in action. At the close of the operation, the limestone is found to be converted into caustic lime. A more full statistical view of this business, may be seen in my former Reports on the Geology of Maine. It is necessary, in case the rock is liable to slag, that it should be broken into pieces of pretty uniform dimensions, or at least, care must be taken to place the larger masses near the fire, and the smaller ones more distant from it. The arches are to be built up of large angular pieces of the rock, not more than six or eight inches in diameter, and they must be laid loosely, so that the flame may penetrate freely through them, and act upon the superincumbent mass of broken lime-rock. I have seen some persons break the limestone in the kiln. This should never be done, for the small pieces fill up the interstices in the charge, and prevent the passage of flame and heated air, required for the draft of the kiln.

In laying the arches of limestone, make them coincide with the arches of the kiln—pack the pieces so as to allow the passage of the fire, and lay the limestone in a very loose manner, until the kiln is half full. Then you may throw in the smaller pieces in confusion, and fill up the kiln to the top. This being done, place your fuel in the arches and kindle your fires, and drive them until the lime is sufficiently burned, which may be from three to four days and nights, according to the kind of rock, and the intensity of the fire.

A smaller kiln may be required in some towns, and in cases where the farmer burns his lime for his own use only. I therefore, herewith present a plan for such a kiln.

FIG. 2.

This kiln is of a cylindrical form, rather wider outside at the bottom than at the top, so as to give it more solidity. It is ten feet high, and five feet in diameter at the top, while the bottom internally contracts a little, so as to support the charge. This contraction is unnecessary, excepting where the limestone crumbles, or "*fine burns*," during its calcination. The arch may be made four and a half or five feet high, and two and a half or three feet wide, so as to allow room for discharging the lime, after it is burned. The kiln may be made of any rock, capable of withstanding a full red heat. Talcose slate, mica slate, or even common clay slate, will answer. It must be pointed with clay inside, and with mortar on the outside. In charging this kiln, the stone is broken into suitable sized pieces, and an arch is built up corresponding with the arched opening and extending quit

across the diameter of the kiln. Having laid up this arch loosely, pack the kiln in a careful manner, until it is half full of the broken limestone; then you may throw in the smaller pieces on the the top, and fill the kiln entirely. It is now set for burning, and you have only to place the wood and kindle a fire in the arch, keeping the heat gradually increasing, until the limestone is sufficiently burned. This may be known, either by the time required, or by the appearance of the pieces at the top of the charge. It will generally be noticed, that when the fire has done its office, that the smoke ceases to appear at the top of the kiln, and a flame rises through the interstices at the top. The charge begins also to settle a little. The time required for the burning of lime, varies with the different kinds of lime-rock, and hence it is alone to be learned by experience in a particular case, and with the kind of kiln with which the lime burner is acquainted. One or two fair trials, will teach any intelligent man how to do the work in a proper manner.

The cost of the lime prepared in a small kiln, is always a little more than when it is made in a large way; hence where an extensive demand exists, the three hundred cask kiln would prove the most profitable to the manufacturer. Most of the limestones here described, may be burned at the cost of twenty-five cents per cask, in bulk—or for fifty-cents, packed in casks. Where it is to be used on the spot, in agricultural improvements, it may be thrown out of the kiln, and allowed to slake itself, and then is ready for immediate use. Its weight is increased from thirty to fifty per cent. by slaking, and its bulk is tripled or quadrupled; hence, where it is to be transported to a distance, it is better to take it in its caustic state, either in bulk or in casks.

A shed ought to be built near the kiln, so as to keep the lime under cover, to prevent its being wet by rain.

Rock, fresh from the quarry, burns more easily than after it has become dry by laying exposed to the action of sun and air.

Limestones, containing pyrites, like that at Brown's corner, in Clinton, give out sulphurous acid gas during the process

of burning, and in such cases, it is unpleasant to have the kiln near the house. In all cases, at the commencement of the operation, much smoke is produced, and it is, therefore, convenient to place the kiln where people are not likely to be annoyed by it. When driving the fire in a lime kiln, you perceive that the limestone melts or slags, you must not increase the heat beyond that point.

Poor limestones are frequently burned best by means of wood that is not perfectly dry, so as not to burn too rapidly. A little experience and discretion, however, will teach any man how to regulate the fire, so as to make the best kind of lime.

By examining the tables, knowing how one kind of limestone burns, you may judge of the others which are there presented. Nearly every variety of limestone found in Maine, I have burned in my laboratory, and know, practically, exactly how they will burn, and the quality of lime that will result. Where the oxide of iron is more than two per cent. the lime will have a brownish tinge, so as to render it unsuitable for plastering ceilings. The slate is merely inert, and gives an ash grey color to the lime, where it abounds.

Silex, when chemically combined with the lime and oxide of iron, forming what are called by chemists *silicates of lime and iron*, produces a hydraulic limestone, liable to melt at a full white heat. It is frequently a valuable article for making hydraulic cement, and abounds in several places in the State, especially at Machias, and at the Forks of the Kennebec river. Many of the rocks described in the catalogues appended to this Report, as calciferous slates, will also make hydraulic lime. They may be burned at a red heat, but beyond that temperature run into a deep green glass or slag.

			per cent.	cent.		cent.		
1	Abbot: Ira Witherum.	Blue—dull.	74.0	24.8	1.2		41.9	Good.
2	Athens Road.	Greyish white—crystaline.	70.4	25.2	4.4		39.6	Good for agriculture, but makes brown lime.
3	Athens Village.	Bluish, compact.	72.6	2.8			40.8	Good for agriculture, slags at white heat.
4	Bingham.	Reddish brown, dull—micaceous—hard.	42.6	55.8	0.6		24.4	Poor—not worth burning for lime.
5	Carthage: B. Winter.	Light grey—granular, containing mica.	89.8	8.8	1.4		50.4	Bears full burning—good for mortar and for agriculture.
6	Carthage: Mr. Reed, No. 2.	Reddish white.	76.2	23.4	0.4		42.8	Good—burns easily—liable to slag if over-burned.
7	Clinton: J. D. Burrell.	Bluish grey—slaty.	47.2	50.4	2.4		26.5	Poor—burns at red heat, slags—makes brown lime.
8	Clinton: L. Brown.	Bluish, containing slate and pyrites.	54.0	43.0	3.0		30.3	Slags at full red heat; makes brown lime—rather meagre, but good for agriculture.
9	Clinton: A. Brown.	Blue, interstratified with thin folia of slate.	76.8	17.2	0.6		43.1	Good—bears full red heat, makes a fair lime.
10	Dexter: E. Crowell's.	Blue, interstratified with thin folia of slate, containing small veins of calc. spar.	90.0	8.6	1.4		50.6	Very good; bears full red heat; makes nearly white lime.
11	Dexter: Mr. Fish.	Bluish, mixed with small veins of quartz and slate.	89.2	9.6	1.2		50.1	Good—like the above.
12	Dexter: L. Pullen's.	Bluish, compact; interstratified with thin folia of slate.	78.2	20.0	1.8		44.0	Good—but not quite so strong as the preceding.
13	Dexter: John Puffer.	Bluish—slaty—compact.	84.0	14.4	1.6		47.2	Good—makes strong lime.

Tabular view of the Analyses of Limestones collected during the Geological Survey of 1838.

No	Locality.	Variety.	Carbonate of Lime, per cent.	Insoluble matter, per cent.	Oxide Iron, per cent.	Magnesia, per cent.	Lime, per cent.	Remarks.
14	Dixfield.	Bluish, with crystals of actynolite.	69.4	29.2	1.4		38.9	Burns at red heat, slags at higher temperature; slakes coarse.
15	Dover: South side of River.	Bluish grey; mixed with slate, calc. spar and quartz.	70.6	25.4	4.0		39.7	Burns at a full red heat, slags at white heat—makes brown lime.
16	Dixfield: Mr. Holman's.	Dark bluish grey, dull—micaceous, containing small crystals of actynolite.	79.6	20.0	0.4		44.7	Burns solid at a full red heat, slags at white heat—good lime.
17	Dover.	Bluish grey—seams of calc. spar, containing slate and quartz.	70.6	25.4	4.0		39.7	Not so good as the above; makes brown lime.
18	Farmington, Titcomb's Hill: J. D. Coney's.	Dull bluish; mixed with slate.	88.8	6.4	4.8		49.4	Bears a full red heat, slags at a white heat; makes brown lime.
19	Farmington Hill: D. J. Coney.	Bluish, slaty; mixed with mica slate.	84.4	14.4	1.2		47.4	Like the above; but makes a better colored lime—ash grey, white when slaked.
20	Forks of Kennebec, Mr Foster. Recommended for hydraulic lime.	Buff-color—compact, stratified.	54.4	27.0 silex 8.2 alu.	carb. iron 2.8 silicate iron & mang. 2.4	5.0	30.5	Good for hydraulic lime, to be burned at red heat. Runs into glass at white heat.
21	Foxcroft Falls.	Light-blue, containing calc. spar, pyrites and slate.	35.6	62.0	2.4		19.9	Too poor for lime, but will answer for flux to iron ore.
22	Foxcroft: Cave near river.	Bluish—interstratified with slate, containing pyrites.	48.8	47.8	3.4		27.4	Poor—good only for flux to iron ore.
23	Guilford—River.	Dark blue.	84.8	13.8	1.4		47.6	Good—bears a full red heat, makes white lime, that will answer for all ordinary uses.

								brown lime.
26	Industry—on Farmington Road.	Blue, micaceous, containing blue calc. spar.	76.0	21.2	2.8		42.7	Good—bears a full red heat; makes a brown lime.
27	Jay: Mr. Noyes.	White—crystaline, containing quartz and actynolite.	not good—rejected as useless.					
28	Livermore Falls.	Grey, with numerous crystals of actynolite.	62.8	34.0	3.2		35.3	The lime burns white, but is full of crystals of actynolite, but will answer for agriculture.
29	Mount Vernon.	Greyish white—granular—numerous crystals of actynolite, mixed with mica slate.	48.8	47.0	4.2		27.4	Bears a full red heat. The lime is white—but is full of crystals, that make it coarse. It will answer for agriculture.
30	New Sharon: J. Bean.	Blue, mixed with mica slate.	53.8	36.0	10.2		33.1	Bears a full red heat. The lime contains brown scales of mica, and is dark brown.
31	New Sharon: J. Winslow.	Light blue, micaceous.	77.0	20.6	2.4		43.3	Good—makes fair lime of a brown color.
32	New Sharon: S. Tollman.	Light blue, micaceous.	88.2	10.2	1.6		49.6	Good; less brown than the above.
33	Norridgewock: S. Sylvester.	Bluish, mixed with slate.	88 2	10.6	1.2		49.0	Good; burns solid, slakes well; is light brown, but strong.
34	Norway: W. Parsons.	Greenish grey.	51.4	47.6	1.0		28.8	Makes a weak lime; slags at full red heat.
35	Norridgewock: A. Wood	Dark blue, micaceous.	51.2	48.4	0.4		28.7	Weak lime; slags at high red heat.
36	Phillips: I. Whitney.	Granular, stratified with dark and light stripes.	64.8	34.4	0.8		36.3	Makes good lime; fine, burns a little; will slag at a white heat.

Tabular view of the Analyses of Limestones collected during the Geological Survey of 1838.

No.	Locality.	Variety.	Carbonate of Lime, per cent.	Insoluble matter, silia or rock, per cent.	Oxide Iron, per cent.	Magnesia, per cent.	Lime, per cent.	Remarks.
37	Phillips: E. side County Road.	Greenish grey, compact.	67.6	26.8	5.6		37.9	Weak, slags; makes brown lime.
38	Phillips: I. Whitney.	White; granular.	65.0	34.6	0.4		36.5	Like the other variety; fine, burns a little.
39	Phillips: W. side County Road.	Greyish white.	5.2	88.2	6.0		2.9	Not good for lime.
40	Poland: N. Bray.	Greenish white; granular, containing actynolite.	43.6	54.4	2.0		24.4	Makes brown lime, coarse when slaked.
41	Rumford Falls.	Greyish white; crystaline, with crystals of actynolite.	78.0	20.8	1.2		43.9	Fine, burns; but makes a good strong and white lime; good for every usual purpose.
42	Skowhegan Falls.	Bluish grey, mixed with a little slate.	52.6	38.6	3.8		32.3	Good for agriculture; but is brown colored.
43	Strong: Norton's Mills.	Containing calc. spar, mixed with a little slate.	90.5	8.4	1.0		50.8	Good for lime; makes a good mortar.
44	Temple: I. Varnum.	Bluish grey, dull, micaceous, containing spots of iron.	70.2	28.4	1.4		39.5	Burns at red heat; slags at higher temperature; makes light brown lime.
45	Thomaston: Beechwood Q., hard stone.	Stratified with blue and grey stripes.	55.6	2.8	1.2	carb. magnesia 39.4	31.2	Burns solid; slakes well; makes good white lime for mortar.
46	Turner: S. Davy.	Greyish white—granular—with crystals of actynolite.	74.6	25.0	0.4		42.9	Good; burns to good lime, but contains crystals of actynolite, and is coarse.
47	Turner: Oak Hill.	Greenish grey, granular.	40.0	59.0	1.0		23.7	Not good; will not make lime.
48	Union.	Brown, with numerous pieces of hornblend.	9.8	38.0	52.2		5.4	Not good for lime.

49	*Waterville: Gen. Robinson.*	*Bluish, dull, interstratified with slate.*	47.2	47.2	5.6		26.5	Too weak to make good lime.
50	*W. Waterville—Great* Falls.	*Bluish, interstratified* with thin folia of slate.	73.8	24.8	1.4		41.4	Good for agriculture; makes lime of a light brown color; slags at a white heat.
51	West Waterville: Mr. Crowell's.	Light bluish, interstratified with thin folia of slate.	89.8	9.0	1.2		50.4	Good; makes light brown lime.
52	Winslow: James Wall.	Light bluish grey, with small veins of calc. spar.	73.8	24.2	2.0		41.4	Good for agriculture; makes brown lime.
53	Winslow: T. Simpson.	Light grey, dull, coated with slate.	68.4	31.0	0.6		38.4	Burns at red heat; slags at higher temperature; makes weak lime.
54	Winslow: Mr. Drummond's.	Blue;—interstratified with slate.	81.8	16.2	2.0		45.9	Good; burns at full red heat; slags at white heat; makes brown lime.
55	Winslow: Mr. Furbur.	Dark blue, mixed with a little slate.	77.8	20.6	1.6		43.7	Good; burns at red heat, and slakes light brown.
56	Winthrop: J. Richard's.	Dark granular.	78.8	20.2	1.0		44.3	Good for lime; burns well at intense red heat; makes a solid lime, that slakes well, and is full of scales of mica. It is strong.

REMARKS ON THE IRON ORES.

A tabular view presents the results of my researches on the various iron ores, analyzed during the present year.

In several instances, there are sufficiently large deposits in a single bog, to supply a blast furnace for many years. Other localities are found, situated so near together that it would be easy to transport the ore to some common central point, where a blast furnace might be erected for smelting the ore. By consulting the map of the State, it may be seen where the most convenient localities are found for the above purpose.

Iron ores will bear transportation to a great distance, as is evident from the fact that it is found to be a profitable business to bring the bog iron ore from New Jersey, and from the islands on the coast of Maine, to Boston and Plymouth, from whence it is transported over land to furnaces situated in the interior, from fourteen to twenty miles, and there to convert it into iron, and carry the iron to Boston for sale, where much of it is purchased by citizens of Maine.

Although bog ores are not so rich in iron as some of the solid or mountain ores, they are so much easier smelted in the furnace, that the workmen generally prefer them; and by the hot blast applied to a furnace fed by charcoal, a much larger proportion of good iron may be obtained than is usually extracted by the common methods.

Bog ores mix advantageously with the magnetic iron ore in the blast furnace, lighten the charge, and make the slag run better; so where they can be obtained within reasonable distances, they ought to be mixed and wrought together.

Where magnetic iron ore alone is to be wrought, such as occurs at Marshall's Island and Buckfield, it may be more conveniently converted into bar iron directly, by the bloom forge—and such forges are of but little cost, and may be advantageously set up for working such ores. It sometimes happens that iron pyrites, or arsenical iron, occurs accidentally in the bog ores, and then it injures the quality of the bar iron, making it brittle or "*short.*" A portion of these troublesome matters may be expelled by roasting the ore by means of a wood fire, over which the lumps of ore are to be

ed, and allowed to remain until the fuel is burnt away. A tion of the arsenic and sulphur will remain, and still con- inate the iron. Ores, containing this substance, are to used, then, only for the manufacture of cast iron.

n a few instances, a slight arsenical odor was perceived ing the roasting of bog ores from Maine. The pulveru- t variety, or ochre, from Clinton and Skowhegan, contains nuch of this impurity that it is unfit for wrought iron. Such s arise from the decomposition of arsenical iron pyrites, nmon in some of the slate rocks around the deposit. Of the iron ores, the red and brown hæmatite are considered best, since they yield about fifty-four per cent. of iron, and just heavy enough for a good charge in the blast furnace. ch ores I have found in inexhaustible beds upon the Aroos- k river, near Currier's settlement, and at Woodstock, N. B. om the latter locality, it is now contemplated to ship the , in its crude state, to Liverpool, England—where it will l for eight dollars per ton. It will be carried as ballast the lumber ships. If Woodstock should be granted to United States, in the settlement of the North Eastern undary, this valuable bed of iron ore would prove of tional importance, since it is close to the military post at oulton.

By referring to my former Reports, it will be seen that the nufacture of iron is a most profitable business, and those o have sighed for mines of gold and silver, by looking o the history of such mines in the southern States and in xico, will find that iron mines are the most profitable, and l pay their workmen five times higher wages than those gold.

n examining veins and beds of iron ores, contained in ks, there is no difficulty in ascertaining exactly how many s of iron are included in the bed or vein, the depth of rking being limited by the depth of natural or practicable inage; but bog ores are more difficult to measure, and the antity can only be ascertained approximatively, but near ough for all practical purposes. Small deposits of bog occur in nearly every town, and I would caution those

concerned not to erect furnaces until the quantity of ore has been surveyed by some person conversant with geology, and with the art of working metalic ores; for I have frequently been assured of the existence of inexhaustible beds of such ores, where, on examination, I found only an area of a rod or two square, and but a foot in depth. Persons unacquainted with our profession, are very apt to commit errors of this kind, and they are disposed to believe, that where there is but a mere stain of iron, that if they could only dig deep enough, that they would discover a great mass of iron ore. This is a too frequent error, and one which I have the greatest difficulty in eradicating from the public mind. Those stains of iron rust on the rocks, arise alone from the decomposition of pyrites or bi-sulphuret of iron—a substance never used as an iron ore, and mountain ores, as they are commonly called, never dissolve or run down with the water that flows over them. Pyrites does, however, by its decomposition, furnish all the bog iron—but it would be utterly worthless if it contained any of the pyrites in it. It is, therefore, of great importance to know that this mineral is thoroughly decomposed; and that can be learned only by chemical analysis. It is unusual to find a bed of good bog iron more than two or three feet thick, and more frequently it is but a foot in depth. In order to ascertain the quantity of ore, you must measure the area of land where you know it to exist, and prove its depth over the whole area by digging through it. Then if you multiply the area in feet by the depth in feet, you will have the number of cubic feet of the ore. Ascertain how much a cubic foot of it will weigh, by taking its specific gravity, and analyze the ore, to ascertain its per centage. Then you can calculate the number of pounds of iron in the deposit, and learn whether the supply is ample or not. In the present Report, may be seen examples of such measurements; and where there is a sufficiency of good iron ore for supplying a blast furnace, I have mentioned the fact, and where there was not, I have also noted it, as may be seen in the preceding pages.

Locality.	Variety.	Water and vegetable matter, per cent.	Insoluble matter, per cent.	Pr. Oxide of Iron, per cent.	Iron, per cent.	Per Oxide of Manganese.
Andover: E. Merrill's,	Brown, resinous and vescicular,	21.0	3.4	75.6	52.3	
Argyle: Hemlock stream,	Brown pan—vesicular, resinous,	29.6	4.6	65.8	45.55	
Bristol: McCobb's,	Yellow—bog iron,	22.0	15.0	63.0	43.	
Bucksport, near Orland,	Yellow—vesicular,	17.8	4.0	56.4	39.	
Clinton: Mr. Foster,	Brownish yellow—pan—resinous,	18.0	13.4	68.6	47.55	
Clinton: Mr. Burrell's,	Yellow—vesicular.	33.0	4.4	62.6	43.3	
Dixfield,	Yellow and brown vesicular,	25.2	3.6	71.2	49.35	
Dover: A. Hinds—No. 5, 11th Range,	Hard pan—yellowish,	20.0	4.0	73.0	50.61	
Dover: Rodger's,	Manganesian iron ore—light—black (bog Manganese,)	34.5	0.7	21.7	14.55	42.0
Do. do.	Bog iron—resinous, vescicular,	13.0	46.5	40.5	28.07	
Farmington: Wyman's Hill,	Yellow—pan,	12.2	18.8	69.0	47.84	
Foxcroft: I. Richardson,	Yellow, containing numerous fragments of slate,	17.0	17.0	66.0	55.76	
Greenwood: Mr. Bradbury,	Brown and yellow—resinous, compact pan,	18.8	6.2	75.0	51.99	
Jay: S. Norton,	Yellowish brown—vesicular,	21.4	8.2	70.4	48.80	
Liberty: B. C. Mathews,	Black—resinous—heavy,	22.0	11.2	59.5	41.24	7.3
Rumford: S. Lufkin's,	Brown,	18.0	2.8	79.2	54.9	
Winslow,	Compact pan—resinous,	15.8	6.2	78.0	53.07	

Dr. Stephenson's Report, and Remarks on the State Boundaries.

Herewith I present the Report of my assistant, Samuel L. Stephenson, M. D., who was charged by me with the exploration of a portion of the Androscoggin and Megalloway sections. His researches will prove very interesting and important to the people of Maine, and shew that we have a good counter claim against the British encroachments upon the territory of Maine—for the north-west angle of Maine, as appears from this Report, is at present fixed at least *ten miles too far south of its true place*, and it is evident that a small brook has been mistaken for the main Megalloway river, in marking the north-west angle of Maine and New-Hampshire. The latter State has also a right to extend the line of its territory farther north than the present limits, as marked by the commissioners.

It is certainly of great importance to the peace of the country, that the whole northern and eastern boundary of Maine should be *forthwith accurately surveyed and permanently marked* by proper monuments, and I trust that so important a national question as the territorial limits of one of the States of this great and glorious Union, will not be allowed to remain unknown and undefined. Before closing this Report, allow me to remark that it is of the greatest importance to both Great Britain and Maine, that the claims of the two countries should be *forthwith adjusted.* Let the British Government at once fairly and honorably acknowledge the claims of Maine, as she ultimately must—for nature has too distinctly marked her boundary in accordance with the letter of the treaty, to admit of a doubt—and then some arrangement, convenient to the two countries, can be easily made, so as to give the British free communication between New Brunswick and the Canadas, while they, in return, can give us the free navigation of the St. John river, with a depot at its mouth. *Now* is the time to adjust this importa-

question; for we have, as yet, not granted lands upon that tract of territory embraced between the Madawaska, St. John, the sources of Restigouche and Metis rivers, and have, therefore, still the right of ceding a portion of it for an equivalent; *whereas if a single settler should receive a grant of land upon that territory, it would be out of the power of Government, without his consent, to alienate his possessions. Delay, therefore, is extremely dangerous to the peace of the two countries; for we do not know the temper that may influence a future Legislature, and it may become their policy to settle the country even to the very extreme north-east angle of Maine.* If the British government arrange matters properly, the people of Maine might be induced to dispose of that trapezoidal tract of country, just mentioned, and take, as an equivalent, the strip of land on the west side of the St. John, extending from the Monument, at the sources of the St. Croix, to the Grand Falls of the St. John, allowing the State of Maine also the free navigation of the St. John river. This is the best arrangement for the welfare of the two countries, and is the best offer that the United States ought to make to Great Britain. This, however, ought to be made *an after consideration, when our whole title shall be acknowledged.*

Another arrangement may also be made, by settling the boundary as claimed by us, and giving to Great Britain the free right of passage on the Frederickton and Quebec road, forever, in exchange for the free navigation of the St. John. Should war hereafter take place between the two countries, the strongest party of course would prevail either in stopping the use of the road or the river; *but during peaceable intercourse, both parties would be gainers by this adjustment.*

In the former proposal, we should gain one very important point, viz. the possession of the Aroostook Falls, which is one of the best water powers in the country, now just within British limits; and these Falls, at the mouth of the Aroostook, could be turned to great account in sawing lumber, or in driving a blast furnace and forges, to work the great bed of iron ore, discovered by me, upon that river, during the last

year's survey. *The working of those mines will be of very great advantage, not only to our people, but also to the provincials upon the St. John; for if excellent iron is furnished them at a lower price than they now pay for it, their prosperity will be advanced in no small degree.*

C. T. JACKSON.

DR. STEPHENSON'S REPORT.

ARLES T. JACKSON, M. D.,

Geological Surveyor of the State.

—Agreeable to your instructions I have examined ctions of the Androscoggin and Megalloway Rivers, for want of time, and other circumstances, have been l to omit, and beg leave, most respectfully to submit ult of my observations, hoping that the very limited lowed for its preparation, will be sufficient apology many imperfections.

he 26th of July I left Augusta in company with Mr. one of the assistants, and commenced an examination route from that place to Lewiston Falls on the scoggin River. Little of geological interest occurred arrived at East Winthrop Meeting House, where the l scratches were very distinctly observed on the mica ocks, the marks were very large and deep, shewing the se size of the diluvial boulders which have ground the of the rocks. The direction of these marks is nearly and South, the direction of strata of mica slate is N. S. W.

Lewiston Falls, on the west side the river, there occurs o the waters edge a dyke of green-stone trap, two feet hes in width, having been forced up through a stratum a slate. Direction of trap dyke N. 80° W., S. 80° E. ocks at this place consist of coarse granite and mica with so much distortion of strata that it is almost ible to obtain their direction and dip. The fall of at this place is about twenty feet, and it is a place of nable resort for the people in that vicinity, to witness iters as they dash from precipice to precipice.

In this town, Danville and Minot, we collected a number of specimens of soil, the analysis of which, see Dr. Jackson's Report. They yield luxuriant crops of grass and grain. On the 31st of July we pursued our course to Poland, where we discovered a bed of limestone on the farm of Mr. N. Bray, is of good quality, and occurs in great abundance. The direction of the bed is N. E. and S. W. This quarry has been opened in one or two places, in one of which we discovered a dyke of greenstone trap two and a half feet wide, runs N. 80° W., S. 80° E. A smaller dyke was also discovered about twenty feet from the first. These trap dykes were not however of sufficient width to change in the least the appearance of the limestone. The exact width of the limestone bed could not well be ascertained without occupying more time than we felt ourselves authorized to spare at this place. We traced it by its outcropping, several hundred feet in length, and I have no doubt that it is of sufficient width to warrant operations. Good lime has been made near this place, and I see no good reason why lime cannot be burned, not only to advantage to the owner, but also to all the people in that vicinity. Lime can be made at this place for fifty cents per cask. Wood costs nothing. Labor costs from nine to ten dollars per month.

Upon the farm of Mr. Waterhouse, about half a mile from Poland Village, a little poor limestone was discovered, but its very limited quantity, and the granite rocks having been forced up through and mixed with it, render it unfit even for agricultural purposes. It cannot be supposed that, by the discovery of limestone in the interior of our State, that it can be furnished to any other market than that within the vicinity where it is discovered. But, as every intelligent farmer considers lime as indispensible to the successful cultivation of the soil, it should be wrought at every locality where it is discovered, in order to supply the increasing demand of this class of community. While in this town, we visited, by invitation, Pigeon Hill, to examine a bed of iron ore, which we were assured existed at that place; but on investigation proved to be a bed of slate, containing iron pyrites, or the

bi-sulphuret of iron, which, by chemical decomposition, had oxidized such rocks as came in contact with it. It also contained arsenical pyrites, which was proved by the distinct garlic odor given out under the blow pipe.

August 2d, continued our course to Turner, and were there requested to examine a locality, where iron and soapstone were thought to abound; but this proved to be a relic of speculation times—as iron pyrites and mica slate were all the indications of iron ore we were able discover.

On the farm of I. Cole, about half a mile from Turner Village, we discovered some excellent specimens of limestone upon the road-side, which had been, at some previous day, blown from a ledge. It crossed the road in a north-east and south-west direction. On further examination of this locality, it was found to out-crop again on the land owned by Mr. P. Burrill; and from appearances here presented, I think there can be no doubt of the existence of a valuable bed of limestone beneath the superincumbent soil, as a well, recently dug at this place, brought to light some fine specimens of the stone. The length of this bed was traced one hundred and fifty feet in length by its out-cropping edges, but want of time prevented our removing the immense body of earth which overlaid the stone, to ascertain its exact width. The direction of limestone bed is north-east and south-west. The rocks in the vicinity are granite, talcose and mica slates. Wood costs but little. Labor costs from eight to ten dollars per month.

Saturday, August 4th, we visited several caves, the entrance of which was from the side of the mountain, situated on the land belonging to Mr. E. Pratt, on the western side of the river. From some cause, the huge blocks of granite which form the walls of these subterranean apartments, have been so arranged as to form spacious halls, and present a striking regularity of appearance. We were furnished by our guide with lamps, &c., by which we were enabled closely to examine each apartment, as we entered. The first cavern we entered, was about twenty feet long, and from ten to twelve feet wide, with high overhanging walls; and the rocks

presented the appearance of having been thrown asunder by some wonderful convulsion of nature, and the damp and chilling atmosphere was similar to that on visiting the sepulchres of the dead. From this, we continued our course by slow and cautious steps, down a pathless descent into the second, which did not differ in any respect from the first. We continued our explorations of this cavernous district, descending with great caution from one to the other, until we had visited six of these subterranean halls, situated one above another, and all corresponding in general appearance, but diminishing in size as we descend—when the last would not admit a person, in an erect position, but were obliged to crawl on our hands and knees, taking great precaution not to meet with the misfortune of losing our lamp, which, at this period of our explorations, was of great importance to us; for had we suffered the misfortune to have our light extinguished, we might have been compelled to grope about in darkness, without even a hope of a happy deliverance from such an uncomfortable situation.

The people at Turner, take a lively interest in the subject of geology, as was evinced by their unceasing attentions to us, during our stay at that place. To Col. Andrews and Major Clark, are due our particular acknowledgements, for their aid in exploring the various localities in that town.

South from the village of Turner, there occurred a bed of bog iron ore, on the farm of Mr. T. L. Davis. On examination of this locality, we discovered some good specimens of the bog ore; and by removing the top soil, we were enabled to expose the ore to view, and by the assistance of several gentlemen, were able to remove the ore to the depth of three and a half or four feet, observing at the same time, that the ore was of better quality and more compact, as we descended. The length of this bed is three hundred feet; the width was not ascertained, on account of water in the bogs below. Iron of good quality, was made at this place some fifty years since. What per cent. of iron it yielded, or why it was abandoned, could not be learned in a satisfactory manner.

On the road from Turner to Livermore, near the house of L. Davy, Esq., the out-cropping edges of a limestone bed, are noticed. Some good specimens were obtained, but probably it does not exist in great abundance. This is undoubtedly a part of the same bed discovered at Turner Village, as the direction from that point is exactly north-east. Limestone, in small quantities, was discovered in various parts of the town, and can, without doubt, be burned to great advantage for agricultural purposes. The farmers make use of lime largely as a top-dressing for their soils. The crops of grass and grain at this place, appear as luxuriant as any I have seen in the State. On the farm of Mr. O. Pray, the granite soil yields from twenty to twenty-five bushels of wheat to the acre. On the farm of J. Washburn, on the same road, it yields of clover two tons per acre.

The rocks on the route from Livermore to Jay, assume a more slaty appearance, and some fine specimens of mica slate were obtained. Direction of strata, N. 47° E.; dips S. 43° W. At Jay, on the east side the river, we were requested to examine a coal formation, which some citizens supposed existed there, on the farm of Mr. Savage, but on exploration of this locality, it proved to be a granite formation, in the place of coal, and of course, no coal or indication of it, could exist there. In our examinations at Jay, but little of interest was observed for the extent of country, which we explored. A little limestone was discovered in several parts of this town, but from its limited quantity, and the presence of much foreign matter, it cannot be of much importance to the town.

From Jay to Dixfield, about one and a half miles north-west from the former village, we observed a high bluff of granite, at the base of which, and in the valley below, the Androscoggin once poured its troubled waters. Immense granite boulders are here distributed one above another in the greatest confusion, leaving a space between, that bears evident marks of once having been the river's bed. The rocks, in place, on the road from Jay to Canton Point, are granite and mica slate. Fine specimens of granite were obtained at Canton Point, half a mile north of the village,

and blocks of it can be obtained with perfectly smooth surfaces, thirty feet in length, and of any required thickness. This mountain of granite would be of great value, if it were not situated so far from a market, being of superior quality; but as it is, will be of little importance to the community, being only used for underpinning for the buildings in this vicinity. Dixfield is a village situated on the east side of the Androscoggin, and it presents a lively and business-like appearance. The mills for the manufacture of lumber and flour, are in a very prosperous condition. This village is surrounded by many high mountains, the summits of which are granite, and the sides and bases are composed of slate. We visited one of the most prominent mountains, called Tumble-down-Dick—taking its name from the circumstance that an Indian, by the name of Dick, once ascended this mountain, while under the influence of a powerful excitement, (alcoholic ?) and venturing too near the edge of the precipice, was thrown from that lofty eminence and dashed to pieces upon the rocks below. Upon the side and summit of this mountain, there are immense diluvial boulders of granite, some of which weigh several tons. The diluvial scratches are very distinct, and run N. 10° W., S. 10° E. In the eastern part of Dixfield, we discovered a small vein of limestone, containing a large proportion of foreign matter. Several other localities of similar character were found in different parts of the town, but at no one place there could I recommend the burning of lime.

At Rumford Falls a fine bed of limestone was found, from which large quantities of lime may be burned at pleasure, and the inhabitants are already making preparations to commence the work. They have long wished for limestone in their own vicinity, by which they can more successfully cultivate their soil. This lime occurs in the bed of the Androscoggin River, and may, by means of an inclined plane, be brought to land and rendered exceedingly useful to all classes of the community. Its direction is nearly N. E. and S. W. Some good specimens of black tourmaline were found at this place, also several specimens of pyritiferous slate and mica.

The paint mines at Dixfield have attracted some attention on account of a quantity of the paint having been used with success. The paint or yellow ochre is formed by the chemical decomposition of the pyritiferous slate, and at this place it can be obtained in very great abundance, and answers very well for common purposes, but as an article for the market, it is of little value, being situated in the interior of the State. The farmers as a general thing in this vicinity, cultivate their soils in a judicious manner, and notwithstanding their lot has been cast in a broken and mountainous section, yet in very many places are to be seen most luxuriant fields of grass and grain, and there is a spirit indicative of a willingness to receive instruction in the art of agriculture.

From Rumford Point we crossed the Androscoggin River and passed up the west side as far as Bethel. In this town there was but little of interest in the rocks, minerals or soils. At Albany, a few miles above Bethel, we obtained some fine specimens of beryl, and also of green and black tourmalines, and after much labor obtained good specimens of felspar and quartz crystals. This locality has, for many years past, been visited by a great number pupils from almost all the literary institutions within the State, for the purpose of collecting specimens not only for themselves, but to supply the institutions with minerals.

This locality, once so rich in mineral productions, is now almost destitute of interest, and unless great labor, and not a little expense is bestowed, few minerals of interest can be obtained. In order to obtain the specimens for the State Cabinet, and the colleges and other institutions provided for by an Act of the Legislature, I was obliged to blast several times for that purpose. The rocks at this place appear to be undergoing a chemical decomposition, which renders it almost impossible to obtain perfect specimens of any mineral occurring at this locality. The rock formation of Bethel corresponds with that of the whole course of the river thus far, it being of the primitive.

On the road from Greenwood to Norway, we observed on the west side of Twitchel's Pond, a dyke of greenstone trap,

forcing itself through the granite formation at that place. Just before reaching Norway Village we passed the beautiful lake, called by the Indians, Pinesewasso Pond, lying in, and to the north of Norway. On the borders of this lake, and extending back some distance, there are fine forests of hard wood growth, which must be of importance to the inhabitants of that vicinity, not only for its heavy growth, but for the richness of its soils, and for the powerful inducements afforded to the agriculturalist. It is astonishing, and much to be regretted that similar tracts of country within the grasp of almost every individual, should be suffered to lie neglected and unimproved. There are too many such valuable sections within the borders of our State, which receive but a small share of public attention; but it gives me much pleasure to be able to testify to the change which is being rapidly effected in the minds of the community in regard to agriculture. In almost every section of our State we find a spirit of anxious inquiry in regard to the chemical composition of soils, and the suitable application to different earths in order to render them at once productive. The erroneous opinion that has too long pervaded the minds of the community in regard to the true merits of the agriculturalist, and the prejudice which has existed against "book farming," (as it is erroneously called) is now (happily for the State) fast fading before the lasting effects of truth, and scientific research, as recorded in works containing the concentrated experience of ages and applied to our own soils. On the farm of J. Smith, at Norway Village, the alluvial soil produces 60 bushels of corn to the acre without the aid of lime, beyond that which the soil naturally contains, and but little animal manure is used. In this town was discovered a bed of limestone, and notwithstanding it is not of good quality, and contains a portion of foreign matter, yet it can be used to advantage in that vicinity for agricultural purposes.

Thus having finished this section of the survey, we proceeded to join Dr. Jackson and the remainder of his party, at Andover, where we met in accordance with our previous engagements. The next morning we all proceeded on our

way to the Umbagog Lake, where we arrived at 3 o'clock P. M. and where we remained at the foot of the lake till the next morning, when we provided ourselves with a quantity of provisions, a boat and two good oarsmen, for our trip among the lakes. On the 26th of September our whole party left the foot of the Umbagog Lake, and proceeded on our cruise over the lake to the mouth of the Megalloway River, which we ascended to the settlement of Capt. Wilson, who resides on No. 5 of the second Range. For the report on the survey from Andover to Wilson's, on the Megalloway, see Dr. Jackson's report.

From Capt. Wilson's, Dr. Jackson and all the party, excepting myself, turned back for the purpose of making further explorations of the lakes, and the country in that vicinity, and I was requested to make an examination of the Megalloway River as far as the north-west angle of the State, and further if not driven from the work by approaching winter. The principal object of this examination was to ascertain if possible the precise point where the line between Maine and New Hampshire ends, as it is currently reported in this section that the Megalloway River takes it rise beyond the supposed Canada line. With this view, and for the purpose of ascertaining the geological and topographical features of this section, I left my party at Capt. Wilson's on the 27th of September, and continued my course up river in a little skiff, which (most fortunate for my purpose) happened to be at this point of the river; and though small and scarcely sufficient to contain two persons, yet the owner, Mr. B. Hilliard, who was bound on a hunting expedition to the very point I wished to visit, offered me every assistance in his power, and I am happy here to acknowledge the kindness of that gentleman, who acted in the double capacity of guide and boatman.

Capt. Wilson by great perseverance, and suffering many hardships, has cleared a large tract of land on the west side the river, and in a few years will amply repay him for all his privations and hardships. Near his house are situated the Esquahos Falls, upon which he is now erecting mills for the

manufacture of lumber, and we were informed that there will soon be erected flour mills on the same falls, to supply the increasing demand of the growing population. Two miles above Esquahos Falls on the east side of the river, the observatory mountain is seen, thickly covered with a mixed growth of hard and soft wood. It is situated to the north of Richardson's Lake, and is the highest mountain in the vicinity of the river. The banks of the river for several miles continue low, and are covered with small trees of spruce and fir, with here and there a birch and maple, till we arrived within half a mile of the Little Megalloway River, which is a small tributary stream from the west, where the banks become more elevated, and at some points of the river can be seen fine growths of hard wood; but farther back from the river are found much superior forests.

We passed up the Little Megalloway one and a half miles to what is called little falls, where we discovered a ledge of argillaceous slate crossing the river in a north-east direction. This is the first place of geological interest which I have seen since leaving Esquahos Falls. For eight miles previous to reaching the Little Megalloway, we passed a level and swampy region for the distance of eight miles, and is called by those who have visited this section, long meadows. It is a low swampy section of the country, extending back from the river on either side to the distance of one mile, and upon which nothing grows but the tall meadow grass, which is very luxuriant, growing to the height of three or four feet. The river at this point is exceedingly winding in its course, and it often happened that after a toilsome and fatiguing day's work, that we found ourselves, not more than three miles from our morning's starting point.

The banks of the Little Megalloway, and the hills in the rear, are richly covered with a yellow birch and maple growth, and is an indication of a good soil. To this point I have seen but very little good pine timber, none suitable for the manufacture of the different kinds of lumber called for by our markets, but I was informed by my boatman, that back from the river five or six miles there exist fine timber lots.

were informed by our friend Wilson, that from the east-
side of the Little Megalloway, one mile from its mouth,
had been a path well bushed out, which if we could
and carry over to Parmachena Lake, would save much
r and trouble on the main river, but we were unsuccessful
ir search for it, and were obliged to return to the main
and set our boat up over the rapids to the distance of
or six miles. In some places so powerful was the cur-
that we were compelled to take our boat from the river
carry by the most formidable of them. We, however,
much trouble, succeeded in landing our boat and pro-
ns at the carrying place from the river to Parmachena
, which is one mile. We encamped at the carrying
e on No. 5, fourth range of townships. Early the next
ing after partaking bountifully of our pork and bread,
ommenced the task of carrying our baggage over a long
to the lake, which occupied more than half the day, as
path, though well bushed out, was exceedinly hard to
w, and we had not the satisfaction of seeing our boat
provisions safely landed, till we had made three trips
no small weight on our backs, at each trip. Parma-
a lake is not laid down on the State map, but is a beau-
sheet of water, three miles in length and about one in
h. Some granite boulders were found on the borders of
ake, but no rocks in place were seen. The land in the
ity of this lake is exceedingly fine, and would most
oubtedly prove a valuable tract of country, were it not
ted so far north, beyond the reach at least of civilized
. The hills in this section are not high, but gently slop-
to the south, clothed as they are, with nature's richest
nents, render it at once valuable and interesting.

fter crossing the lake to its head, we set about providing
elves with as comfortable a camp as the time would allow.
eing nearly dark when we arrived we had but little time
repare for ourselves, even a partial shelter from the chil-
atmosphere of approaching night, and as we were not
ring the inconvenience of storms, we cut a few fir boughs
s great a length as possible, and placing one end in the

ground, the tops served as a sufficient protection for the head and shoulders, leaving our inferior extremities to the kindly influence of a roaring camp fire. Our bed consisted of fir or cedar boughs, the latter making a most delightful couch from its pleasant fragrance and softness, and with this for a bed, and a knapsack or a pair of boots for a pillow, we passed a very comfortable night. We are now eight miles from the Little Lake situated at the base of the Camel's Rump Mountain, in No. 4, Sixth Range of townships. The next morning we continued our course as fast as rocks and troubled waters would permit, and this day's progress was slow and toilsome, the water being shallow, and rapidly forcing its way amid half covered pebbles on the bottom.

One mile south of the Camel's Rump Mountain, we came in contact with a ledge of argillaceous slate, the direction of which is nearly north and south and dips to the west.

At a little before night fall, we arrived at our place of destination, at the lake, near the base of the Camel's Rump. This lake is about three fourths of a mile in length, and about as wide, and abounds with salmon trout, and other fish, usually found in our fresh water lakes. It was here that the uninterrupted fine weather, with which we were favored the whole route to this point, was followed by long continued storms of rain and snow, which rendered our progress slow and uncomfortable.

On the 8th of October, I started, with my pilot, from the base of the Camel's Rump Mountain, in search of the boundary line between Maine and New-Hampshire—and having, on our course up river, crossed the line several times, I was satisfied that, by taking a north-west course, we must intersect that line in the course of time. We accordingly took provisions sufficient for a two-days cruise, and commenced our march over the north-east side of the Camel's Rump, and at four o'clock, P. M., we struck the line after having walked five or six miles. Our course now, as we thought, must be a plain one; but we were disappointed, and it proved that our difficulties had just commenced, and it was with the greatest trouble that we could follow the line at all, it being

so badly spotted by those who were engaged in the survey; and we were constantly annoyed by a variety of spotted lines in almost every direction, which have been made by the hunters in this region, as guides to their traps. In this broken and mountainous region, and in the midst of so many lines of doubtful character, it would have been impossible to have felt any certainty that our course was a correct one, had it not been for one circumstance, which served as a tolerably sure guide. It was on account of the number of spots on the trees—the State line generally having *two* or *three spots*, of different ages. We, however, continued our course in a most diligent manner, being guided entirely by the number of spots on the trees, and by the compass, as we had ascertained the line to run N. 10° E. by the compass, and at the end of two days and a half, we reached the long sought line, over mountains of rocks, that we found it almost impossible to ascend, and through tangled swamps, worse if possible, than precipitous mountains. The tree that marks the north-west corner of our State, is situated on the side of a small hill, surrounded on all sides by lands much higher than that where the boundary is established, and from the brooks coming from the north-west and discharging themselves into the Megalloway, *I was convinced that the high lands dividing the waters are not at this point. The monument at this place consists of three large flat stones, marked, one Maine, one New-Hampshire, and the other L. Canada; and being placed in their proper situations, serve as the boundary.* We now pushed forward, to ascertain, if possible, the distance to the Megalloway river, which we found to be about two miles, and at this point, was between three and four rods wide, and taking a north-west direction, probably has its source some where near the head of Connecticut river. Here I was obliged to end my explorations, on account of an injury received by one of my ankles, and also for the want of provisions, which were now nearly exhausted. *From the size of the Megalloway river at the point, north of the north-west angle of the State, there can be little doubt of the fact that this river takes its rise in Canada, as the boundaries are*

now defined, and that the line dividing Maine and New Hampshire does not run far enough north by eight or ten miles—falling far short of the highlands—thus leaving a large extent of territory in the Canada possessions, that rightfully belongs to these two States. The question of boundaries is one that demands serious consideration, and the people of every State should see to it, that their *border lines are well defined and established. Recent experience will act as a stimulus to the people to see to it, that their dividing lines are sufficiently defined and marked, and thereby prevent being brought into war with a foreign power, or what is yet more to be dreaded, in collision with a sister State.*

The Megalloway section is one that cannot cease to interest every one; for within a few miles of its northern extremity, rivers of the greatest importance, have their origin. On the one hand, there are the St. Francis and the Chaudiere, winding their way to the St. Lawrence; and on the other hand, there are the Connecticut, the Androscoggin, the Kennebec and the Penobscot, each commencing as with a drop from some wandering cloud, and by continued accession of tributary streams from surrounding highlands, pour their troubled waters amid mountains and interminable forests, till they at last, winding their course through verdant fields, and gratifying the fancy of the happy villager, reach their home in the sea.

We now commenced our return march to the foot of Camel's Rump Mountain, accompanied by alternating storms of rain, hail and snow, that continued the whole distance. We had now to march the distance which had occupied two days and a half to accomplish, and with the unhappy reflection, that we were entirely destitute of provision. Our whole dependence was, therefore, on the game which hitherto had been abundant; but in this we were disappointed, nothing presenting itself of an eatable nature, till we had nearly accomplished our journey, when we by accident found two red squirrels, which we ate with much eagerness. This section of country abounds with game of all kinds—such as trout, ducks, partridges, and musk-rats, which is one of the

most delicious of dishes. The hunters in this region, make fine business with their guns and traps, and Mr. Hilliard informed me that he always made one hundred dollars per month in trapping the bear, moose, otter, beaver and sable. Wolves are abundant in this section; and on one occasion, when my pilot was absent, and I without fire, in a violent rain storm, I was serenaded all night by the unceasing music of one of those animals, which, probably, for a want of taste for music, on my part, I was rendered rather uncomfortable through the night.

Thus, having accomplished, in an imperfect manner, the object of my mission, and being driven from the work by the autumnal snows, I took leave, though not without regret, of my excellent boatman, Mr. Hilliard, and set my face towards Augusta, by the way of the Connecticut river.

The distance from the Megalloway to the Connecticut river, is about ten miles. The most of the distance was accomplished in a violent snow storm. There is much valuable land between these rivers. Having acted as far as possible in accordance with your instructions, I beg leave to submit the above in its present imperfect form.

I shall bear in lasting remembrance the many kindnesses I have received at your hands, and beg you to accept the assurances of esteem and respect, with which I am,

Most respectfully yours,

SAMUEL L. STEPHENSON,

Assistant.

APPENDIX.

BANGOR, Maine, August 31, 1838.

DR. C. T. JACKSON, &c. &c.

My Dear Sir:—I must apologize to you for not having answered your very obliging letter of the 23d inst. sooner, which I was prevented from doing by the necessity of being out of town most of my time, during your stay here, on business which I could not delay. I return you my thanks for the barometrical calculations you kindly furnished me with. They are very interesting, as they refer in a great measure to the line I have travelled upon. I have just reduced the observations I have made for latitudes and longitudes, and herewith enclose you the results. I regret that other duties prevented my observing at a greater number of points. I have the satisfaction to say that my chronometer has performed with an accuracy past all my expectations, considering the great distance it has been transported over rough roads in stages, wagons, &c. On the trip from this place to Moose Head Lake, the Canada line, &c., and back here, a distance transported over land, of about three hundred miles, in seventeen days, it varied only two and a half seconds of time from its previously stated rate; and again on the trip from this to Houlton, Calais, Eastport, and back here, three hundred and sixty miles in stages, &c., over very bad roads for the most part, and in thirty-one days' time, it varied four seconds from the aggregate rate previously given it. I have, therefore, much confidence in the longitudes deduced from its running.

I enclose you herewith a copy of a report of mine, containing some tidal observations, made at the northern extremity of Cape Cod, which may be amusing to you at a leisure moment.

With great regard, I am yours,

Truly and respectfully,

J. D. GRAHAM.

Latitudes and Longitudes of places determined by Major J. D. GRAHAM, *U. S. Corps of Topographical Engineers, within the State of Maine,* in 1838.

	North Latitudes			West Longitudes from Greenwich					
	d.	m.	s.	h.	m.	s.	d.	m.	s.
Bangor, (at the Bangor Hotel,) .	44	47	54	4	35	04.3	68	46	[illegible]
Moose River Custom House, (Lowell's,)	45	39	04	4	40	59.	70	14	45
Tachereau's House, on Canada line,	45	48	31	4	41	31.6	70	22	54
Houlton, (Hasey's Tavern,) . .	46	07	28	4	31	13.6	67	48	[illegible]
Amity Post Office, (Dunn's,) being 2 1-2 miles due east of Monument designating head of the St. Croix waters,	45	56	38	4	31	16.1	67	49	01.5
Weston Post Office, ...	45	41	23		*			*	
Calais, (Thompson's Hotel,) . .	45	11	24	4	29	01.8	67	15	27
Eastport, (Fort Sullivan Flag,) .	44	54	28	4	27	53.3	66	58	20

* Longitude not yet worked.

REMARKS ON THE TABLES OF BAROMETRICAL OBSERVATIONS.

Those who wish to make use of the following barometrical tables, for the purpose of ascertaining the altitude of any of the points where the observations were made, above the sea level, are advised to consult the excellent tables for calculating barometrical heights, which may be found in De La Béche Manual of Geology, and also in the French *Annuaire par le Bureau des Longitudes*, 1831–2 and 3. Those who prefer the ancient method of logarithmic calculations, will find rules for the operations in Bowditch's Practical Navigator, 1837, and in various other works devoted to civil engineering and surveying.

I have occasionally in the records given the temperature according to the centigrade thermometer, the attached thermometer, which was graduated after Farenheit's scale, having been accidentally broken during our travels. In case Oltman's tables are used, this circumstance will save the trouble of converting the temperature from Farenheit's scale to the centigrade, and hence I have preferred to let them remain just as they were recorded.

In all cases, I allow the barometer to hang in a shady place long enough to acquire the temperature of the surrounding air, so that it was hardly necessary for me to record the temperature of the detached thermometer. Sometimes, however, there was a trifling difference, owing to the reflection of the sun's rays from the rocks and trees, and then it is noted.

Barometrical levelling, after the method which I have adopted, is very accurate, and the errors are always so small that they would be altogether imperceptible in an ordinary sectional profile, the width of a line drawn by the pen being sufficient to cover the greatest variations, renders it impracticable to draw a plan on paper more accurately than our measurements represent.

For canal sections, which must represent on a very large scale, the minutest deviations from the horizontal level, barometry is not sufficiently exact; but for geological profiles, they are all that can be desired.

No error beyond six feet has been found in any of our measurements of the heights of mountains, by this method; and by many nice triangulations, I have tested the accuracy of them in several instances. The general agreement of the results, calculated in divisions, and then added together, and compared with the whole result of the extreme observations, also give the most satisfactory proof of the correctness of the method.

There is also another great advantage in this mode of measuration, and that is, there is less danger from errors in reading off the instruments, and we can compare the results on single observations, and on the means of many sets—the latter being the most free from fallacious results.

In order to make proper observations, it is necessary to obtain barometers absolutely free from atmospheric air, in which the mercury produces a clear metalic click, when the instrument is gently inclined, so as to allow the mercurial column to strike the summit of the tube, where there is an absolute vacuum, when the barometer is in its perpendicular position. The tube must have a perfectly cylindrical and uniform bore, and the relative capacities of the tube and of the cistern, must be known, so as to allow for the descent of the column from its normal point. A thermometer attached to the instrument measures its temperature, and the record is marked T. A detached thermometer, agreeing in scale with that on the barometer, must be used to determine the temperature of the circumambient air, and the record is marked t.

When you make your observations, those made at the base of the mountain being marked T, t, the observations made at the summit of the height may be marked T' t'. If the height of the barometer, at the base of the mountain, is expressed by h, let that on its summit be marked h', and let c be the centrigrade difference of the thermometers.

If now you look out the numbers in Oltman's tables corresponding with h, and h', you may algebraically express them by a, and b, the letter c denoting the thermometrical difference. Then you have this formula to solve:

$a-b-c=x$=the approximate height; or if the air was warmer on the top of the mountain, it would be $+c$.

For more minute corrections for the difference of temperature, in the different strata of air, multiply the $\frac{1}{1000}$ part of the approximate height by the double sum $2(t+t')$; and the correction will be positive or negative, as the $t+t'$ is positive or negative. A correction of the approximate height is also to be made, for the curvature of the earth and diminution of weight in the latitude given; and this is always additive. With a little practice, any person may learn to make these calculations, since they are short and easy to work.

The most common source of errors in barometrical measurements, arise from the neglect to place a series of well-regulated and compared instruments in a line across the country from the sea-port where the chief stationary barometer is kept, to the scene of operations; for it must be evident that there may be local changes in atmospherical pressure, that ought be known and allowed for in the calculations. When all the instruments at the various sections mark their regular range, there can be no doubt of the uniformity of its pressure, and then the results will be more certain.

When I began my journeys for the season, I took especial care to arrange all these matters, and on comparison of barometers with Rev. Solomon Adams, I found that both instruments marked the same height, and the thermometers are reduced to the same standard. Mr. Adams's instrument is placed 121.8 feet above the high water mark in Portland harbor, and that sum must, therefore, be added to all heights calculated from that station.

On returning from a long tour around Moose Head Lake, &c. with my barometer, and comparing it at the Portland station, I found that the alteration of the column was but $\frac{1}{10}$ inch for that length of time, so that we know there can be no appreciable error in our Kennebec and Canada road section.

Several gentlemen have politely aided me in keeping barometrical and thermometrical registers, among whom are some of the most scientific men in the State.

Hon. Daniel Sewall, of Kennebunk, a veteran in meteorology, and extremely accurate in his observations, and nice in his records.

Rev. Solomon Adams, of Portland, a distinguished teacher in that city, and an accurate and scientific observer.

Prof. Parker Cleaveland, of Bowdoin College, Brunswick, a gentleman well known for his scientific attainments, and accurate in his observations in this department of science, as in others.

Robert H. Gardiner, Esq., of Gardiner, a gentleman well known to meteorologists throughout the country, for his indefatigable and valuable labors.

Mr. J. B. Cahoon, Treasurer of State, has also had the goodness to keep a series of observations on one of our barometers, at the State House, and his tables are neatly recorded, and are herewith presented.

At Waterville, it was very important to have a station, and there I was most fortunate in obtaining the assistance of Prof. G. W. Keely, a gentleman of science, whose name is an honor to the College to which he belongs.

With such efficient and generous aid, I feel confident that our work will commend itself to men of science; and I beg leave here to express my thanks to all the above named gentlemen for their kind and free assistance.

The tables above mentioned will be found in this Report, and also some valuable Rain tables, by Prof. Cleaveland and R. H. Gardiner, Esq.

To Prof. Keely's Barom. h, add $\overset{\text{(inch)}}{0.03}$, to make the instrument correspond with mine.

From Mr. Cahoon's deduct $\overset{\text{(inch)}}{0.01}$.

Now when you wish to ascertain the height of any place where I may have made a barometrical observation, note my record, look out the same day and nearest hour when Mr. Adams made his record at Portland—call that h, and mine h'; and if you wish to know whether the pressure was free from local variation, look over the tables of those who took observations nearest to mine, and mark the difference, if it exist. Having

worked your problem by the rules before described, and obtained the height in feet above the cistern of Mr. Adams' barometer, add to it the height of his instrument from the sea level, 121.8 feet, and you will have the desired altitude.

The intermediate stations may be calculated to great exactness, by taking means of a whole month's observations, and working those *means* as a set of single observations. This being done, you can select any one of the other stations, the height of which you have ascertained, and calculate from that point any others where I have made mine.

It is unnecessary for me to remark on the value of these researches, for any one who knows enough of the subject to feel an interest in them, will at once perceive the important results which we are attaining.

Rain guages ought also to be established in different parts of the State, in order to learn how much rain falls per annum, or per month, in a given section of the State.

I confidently believe, that a vastly greater quantity of rain falls among the mountains and in the woods, than on open or plain land, and that more rain falls amid lakes than on table land. We want, however, a good set of observations to settle the facts in the case, and to inform us of their relations respectively. Such information I propose to obtain, and it will prove of great importance to science and to the arts, for we shall be able to predict the changes that may take place in the great rivers and lakes of Maine, when the woodlands shall disappear before the axe of the settler.

The most absurd notions are prevalent as to the quantity of rain that falls upon the earth, and farmers, so dependent upon its genial influences, ought to know more upon this very interesting and important subject.

TABLE I.

***Barometrical and Thermometrical Observations** made at various points in the State of Maine during the Geological Survey in 1838. Intended to serve for calculating the elevations of the various places above the level of the sea, and for sectional profile views.* By C. T. Jackson.

Date.	Hour.	Where the Observations were made.	Barometer.	Temp. Bar. T.	Temp. air. t.	Remarks.
May 30	5½ P. M.	Sidney road—A. Foot's house.	29.960	61° F	61° F	
"	7 "	Ticonic Falls—Waterville, above.	30.183	58	58	
31	1½ "	" " " "	30.184	69	69	
"	4 "	Waterville, at Prof. Keely's house.	30.070	70	70	
June 2	noon	" " Williams' hotel.	30.050	64	64	
3	"	" " " "	30.030	60	60	
"	1 P. M.	Ticonic Falls, above.	30.130	70	70	
"	1½ "	" " below, at watch rock.	30.170	70	70	
"	2½ "	" " " "	30.170	70	70	
"	3 "	Waterville—Williams' hotel.	30.030	70	70	Clear—pleasant.
4	7 A. M.	" " "	29.980	65	65	
"	11½ "	Skowhegan Falls, above bridge.	30.024	70	70	
"	noon	" " " "	30.050	71	71	
"	"	" " Raymond's hotel.	30.012	71	71	
"	5½ P. M.	Norridgewock—Pike's hotel.	30.000	72	72	
5	12½ "	" " "	29.690	68	68	Rained all day.
"	6½ "	" " "	29.580	68	68	

6	7½ A. M.	" " "	29.680	67	67	
"	6½ P. M.	" " "	29.784	72	72	Cleared a little.
7	8 A. M.	" " "	29.750	65	65	Rained.
"	6½ P. M.	" " "	29.650	64½	64½	"
8	7¾ A. M.	" " "	29.676	60	60	
"	noon	" " "	29.750	64	64	
9	7½ A. M.	Skowhegan Falls,	30.200	62	62	
"	6½ P. M.	" "	30.110	72	72	
10	8 A. M.	" "	30.198	72	72	
"	5 P. M.	Farmington Hotel.	29.820	86	86	Fair.
11	7 A. M.	" "	29.777	73	73	Two feet above ground.
"	noon	" "	29.770	83	83	
"	3 P. M.	Top of Norton's Hill.	29.330	83	83	
"	4 "	Hotel—Farmington.	29.750	84	84	
"	6 "	Top of Powder-house Hill.	29.524	78	78	
12	7 A. M.	Farmington Hotel.	29.750	72	72	Fair—pleasant.
"	9 "	" "	29.750	84	84	" "
"	10 "		29.780	82	82	" "
"	1½ P. M.	Avon—Bates' Tavern.	29.630	84	84	
"	3 "	" "	29.650	84	84	
"	6 "	Base of Mt. Blue—R. Worthley's house.	28.530	73	73	
"	8½ "	Summit of Mt. Blue.	27.030	68	68	
13	5 A. M.	" "	27.000	60	60	
"	7 "	" "	27.000	63	10 ct.	

BAROMETRICAL AND THERMOMETRICAL OBSERVATIONS.

Date.	Hour.	Where the observations were made.	Barometer.	Temp. Bar. T.	Temp. air. t.	Remarks.
June 13	12¾ P. M.	Base of Mount Blue—Ingraham's house.	28.600	73°	23½° c.	
"	1¼ "	" " Dow's house.	28.750	78	78	
"	5¾ "	Phillips—Whitney's hotel.	29.680	80	80	
14	7 A. M.	" " "	29.700	64	64	Rained at 9 A. M.
"	8 P. M.	" " "	29.700	72	72	
15	7 A. M.		29.730	66	66	Cleared.
"	11 "	Humphrey's house, Strong.	29.280	80	80	
"	1½ P. M.	North Salem—Heath's house.	29.400	82	82	Thunder shower on Mount Abraham.
"	3¼ "	" " "	29.400	72	72	
"	7½ "	" " "	29.350	68	68	
16	5½ A. M.	" " "	29.323	69	70	Light N. W. breeze—fair.
"	7 "	" " "	29.322	70	70	
"	8¼ "	Base Mt. Abraham—Robertson's barn.	29.032	74	74	
"	10 "	On the side of Mt. Abraham.	27.520	73	73	
"	11 "	Summit Western peak Mt. Abraham.	26.780	66	18 ct.	
"	11½ "	Summit Eastern peak Mt. Abraham.	26.680	68	18 ct.	

28	7 A. M.	" "	30.150	70	70	
"	8⅓ "	Augusta—level of Kennebec river.	30.300	70	70	Fair.
"	8¾ A. M.	" Oak street, over well.	30.180	69	69	
"	9 "	Augusta House, level of ground.	30.162	69	69	
"	9⅓ "	" room No. 5, 14 feet.	30.150	69	69	
"	4 P. M.	" " " "	29.980	69	69	Violent rain.
"	11 "	" " " "	29.630	66	66	Storm.
29	7 A. M.	" " " "	29.810	68	68	Cleared.
"	noon.	" " " "	29.860	73	73	Light clouds.
"	6¼ P. M.	Waterville—Williams' hotel.	30.030	73	73	Clear—S. W. wind.
"	7⅓ "	" Prof. Keely's house.	30.030	72	72	Clear.
30	noon	Skowhegan—Somerset House.	30.230	73	73	Clear—pleasant.
"	8⅓ P. M.	Athens—Lord's Hill, on road.	29.550	60	60	
"	9⅓ "	Harmony—Bartlett's hotel.	30.080	61	61	
July 1	6⅓ A. M.	" " "	30.060	65	65	Obscure.
"	11 "	Parkman—Hotel.	29.800	66	66	
"	5 P. M.	Monson—Rice's tavern.	29.450	65	65	Obscure—misty
2	7 A. M.	" " "	29.381	70	70	
"	noon	" " "	29.350	68		
"	4⅓ P. M.	Barrows' house, Moose Head road, 7 miles S. from Moose H. Lake.	28.910	70	70	
"	5⅓ "	Mansel's house, five miles S. from M. H. Lake.	28.900	72	72	

BAROMETRICAL AND THERMOMETRICAL OBSERVATIONS.

Date.	Hour.	Where the observations were made.	Barometer.	Temp. Bar. T.	Temp. air. t.	Remarks.
July 2	8¼ P. M.	Gore's hotel, foot of M. H. Lake.	29.100	70°	70°	Thunder shower.
3	6¼ A. M.	Moose H. Lake, at the level with the Lake's surface.	29.100	70	70	Clear—pleasant.
"	7½ "	" " "	29.100	68	18° ct.	Light westerly breeze.
"	7¾ "	" " "	29.100	69½	19¾ ct.	Clear " "
"	9 "	" " "	29.100	72½	20½ ct.	"
"	noon.	Moose Head Lake—Burnt Jacket.	29.090	80	80 F.	"
"	6½ P. M.	Moose Head Lake level.	29.070	78	78	"
"	7 "	" " "	29.060	76	76	"
4	7 A. M.	" " "	29.140	70	70	"
"	9½ "	" " "	29.150	74	74	
5	noon.	Two feet above M. H. Lake level.	29.090	75	75	Gathering clouds.
6	9 A. M.	Moose H. Lake outlet, Lake level.	29.070	75	75	Showers.
"	11 "	Brassau Pond, 3 ft above water.	29.020	74	74	Fresh N. W. wind.
"	12½ P. M.	" " 6 ft " "	29.024	80	80	
"	1 "	" " " "	29.010	75	75	
"	1½ "	" " Level with water.	29.020	76	76	
7	noon.	Long Pond, five feet above water, eight miles from head of Pond.	28.950	75	75	Fair, warm weather—N. W. wind.

		road, 14 miles S. from the Canada line.	28.830	73	73	
8	9 A. M.	" "	28.918	☉92	22 ct.	" "
"	noon.	" "	28.851	79	79	
"	7¼ P. M.	" "	28.760	82	80	
9	7 A. M.	" "	28.660	78	24 ct.	Thunder squall.
"	10 "	" "	28.660	76	24 ct.	Cleared.
"	12⅓ P. M.	Dividing line between Maine and Canada—Height of land at the monument.	27.890	72	72 F	
"	2¼ "	" " "	27.860	74	22⅓ ct.	
"	3 "	" " "	27.880	74	23 ct.	Fair.
"	3⅓ "	Hilton's house, near sources of W. Branch of Penobscot river.	28.271	74	23 ct.	
"	4¼ "	" " "	28.271	79	79 F	Light clouds, (cumuli.)
"	5 "	" " "	28.280	76	76	Fair.
10	8 A. M.	Lowell's Custom House.	28.780	70	70	"
"	noon.	" "	28.750	76	76	Straited clouds.
"	6⅓ P. M.	Capt. J. Jackman's house, 10 miles south from Moose river.	28.020	70	70	Fair.
"	8¾ "	Boise's house—4 miles south from Jackman's, on Canada road.	28.350	68	68	"
11	5¼ A. M.	" " "	28.220	68	68	
"	7 "	" " "	28.230	71	21 ct.	

BAROMETRICAL AND THERMOMETRICAL OBSERVATIONS.

Date.	Hour.	Where the observations were made.	Barometer.	Temp. Bar. T.	Temp. air. t.	Remarks.
July 11	$1\frac{3}{4}$ P. M.	J. B. Smith's house, Canada road, three miles above Forks of Kennebec river.	28.790	82°	82° F	
"	$2\frac{1}{3}$ "	Forks of Kennebec river—Burnham's hotel.	29.270	82	27° ct.	Overcast—calm.
"	$5\frac{1}{3}$ "	Forks of Kennebec river.	29.270	83	$28\frac{1}{2}$ ct.	Clear.
"	7 "	" " 15 feet above river.	29.290	82		
12	$6\frac{1}{4}$ A. M.	" " Burnham's hotel.	29.450	72		
"	$7\frac{3}{4}$ "	Forks Kennebec, level of river.	29.460	71		
"	9 "	" " " "	29.470	76	23 ct.	Fair.
"	$6\frac{1}{2}$ P. M.	Bingham Village—Baker's hotel.	29.770	73	73 F.	"
"	7 "	" " " "	29.780	72	$21\frac{1}{2}$ ct.	
"	8 P. M.	" " " "	29.790	70	20 ct.	
13	$7\frac{1}{2}$ A. M.	" " " "	29.950	65	18 ct.	Overcast.
"	noon.	" " " "	29.960	69	22 ct.	Fair.
14	$6\frac{1}{2}$ A. M.	" " " "	30.040	64	16 ct.	"
"	$8\frac{1}{4}$ "	" " " "	30.040	64	16 ct.	
"	$10\frac{1}{2}$ "	" " " "	30.020	71		Fair—West wind.
"	noon.	Solon—Vickare's tavern.	30.000	70	70 F	Clear " "
"	2 P. M.	" " "	29.960	84		

"	5$\frac{3}{4}$ P. M.	Anson Hotel.	30.030	85		Clear—pleasant.
"	6 "	" Carrabasset stream, below Bridge—level of water.	30.080	84		" "
"	6$\frac{1}{4}$ "	" Milldam, 8 in. above water.	30.020	83		
"	7 "	" Hotel.	30.000	80		
15	7 A. M.	" "	29.900	70		Overcast.
"	noon.	" "	29.840	72		
16	6$\frac{1}{2}$ A. M.	" "	29.770	68		
"	10$\frac{1}{2}$ "	Madison's Falls, below.	29.940	74		
"	5 P. M.	Skowhegan Falls, above.	29.940	80		
"	5$\frac{1}{2}$ "	" Somerset House.	29.910	82		
"	7 "	Clinton.	29.980	70		
17	6 A. M.	" Kimball's hotel.	30.050	70		Fair.
"	4$\frac{1}{4}$ P. M.	" Sebasticook, river's level.	30.150	78		
"	7 "	" Reed's hotel.	30.100	75		
18	10$\frac{1}{2}$ A. M.	" " "	30.120	68	67	
"	11$\frac{1}{4}$ "	" above falls, at dam.	30.240	76	76	
"	11$\frac{1}{2}$ "	" below bridge, river's level.	30.250	76	76	
"	7 P. M.	Waterville—Williams' hotel.	30.030	74	74	
"	9 "	" Prof. Keely's house.	30.010	73$\frac{1}{2}$		
"	10 "	" " " "	30.010	72		
19	8$\frac{1}{2}$ A.M.	" " " "	30.000	72		
27	7 P. M.	Augusta—Hutchins' hotel, 14 feet above ground.	30.030	72		Fair.
29	noon.	" " "	29.830	89		

BAROMETRICAL AND THERMOMETRICAL OBSERVATIONS.

Date.	Hour.	Where the observations were made.	Barometer.	Temp. Bar. T.	Temp. air. t.	Remarks.
July 29	2⅓ P. M.	Augusta—Hutchins' hotel, 14 feet above ground.	29.780	90°		
30	7 A. M.		26.640	92	92°	Thunder shower to the Eastward.
"	1 P. M.		29.550	90	31 ct.	Fleecy clouds.
"	5⅓ "	" " "	29.700	82	27 ct.	Violent squall of wind and dark clouds at 2 P. M.—cleared at 5 P. M.
31	4⅓ "	Dresden—S. Alley's house.	30.000	82		
"	7⅓ "	Wiscasset—Turner's hotel.	29.950	71		
Aug. 1	9¾ A.M.	" " "	29.930	68		
2	11⅓ "	Alna—head of tide.	30.200	72	74	
"	3 P. M.	Damariscotta—level of sea.	30.217	78		
"	4⅓ "	Newcastle—base of shell cliff.	30.217	78		
"	4¾ "	" summit of shell cliff.	30.200	78		
"	5 "	" base " "	30.235	78		
3	8⅓ A. M.	Damariscotta—Borland's hotel.	30.320	78		
4	2⅓ P. M.	Pemmaquid Point.	30.240	73		
5	5⅓ "	Bristol—Wm. C. House.	30.100	79		
6	[illegible] A.M.	[illegible] Falls, [illegible]	29.980	72		

	7	3 P. M.	Feyler's Quarry, Waldoboro'.	29.880	72			
	"	5 "	Ludwig " "	29.870	71			
	"	5¾ "	Waldoboro', high water mark.	30.050	68			
	"	7 A. M.	Hussey's hotel, Waldoboro'.	30.000	66			
	8	2 P. M.	Weatherby's tavern, Warren.	30.050	67			
	"	4½ "	St. George river, near bridge, Warren.	30.050	71			
	"	noon.	West Thomaston.	30.300	80			
	9	5½ P. M.	Beech-wood Quarry.	30.240	71			
	10	11½ A.M.	" "	30.250	74			
Sept.	12		Portland—Mr. Solomon Adams' house.	30.258	65			
	14	7½ P. M.	Raymond tavern.	30.113	64			Fair; Aurora Borealis, splendid coruscations shoot to zenith.
	15	6 A. M.	" "	30.120	61			
	"	11½ "	Great Rattle Snake Pond, Raymond.	30.216	73			
	"	3 P. M.	Raymond—Iron Mine Hill.	29.850	78			
	"	4 "	" "	29.824	72			
	"	6 "	" Great Rattle Snake Pond.	30.240	70			
	16	9½ A.M.	" Longley's tavern.	30.350	58			
	17	8 "	" "	30.100	[illegible]			

BAROMETRICAL AND THERMOMETRICAL OBSERVATIONS.

Date.	Hour.	Where the observations were made.	Barometer.	Temp. Bar. T.	Temp. air. t.	Remarks.
Sept. 17	1 P. M.	Otisfield—Knight's tavern.	29.706	68°		Fair.
"	$2\frac{3}{4}$ "	Oxford—Hill on road.	29.639	70		
"	$3\frac{1}{2}$ "	" Harris' tavern.	29.900	71		
18	7 A. M.	" "	29.710	52		
"	10 "	Little Androscoggin stream.	29.700	72		
"	noon.	Paris Hill—tavern.	29.210	72		
"	3h28′ P.M	" "			19.9°c.	Eclipse of sun commenced.
"	3h52′ "	" "	29.140	70	21 ct.	
"	4h4′ "	" "	29.130		19.2 c.	Sun eclipsed.
"	4h17½′ "	" "	29.120	68		Clouds cover the sun.
"	9h20′ "	" "	29.230	58	58 F.	
19	8 A. M.	" "	29.370	52		
"	11 "	" "	29.380	57		
"	$12\frac{1}{2}$ P. M.	" brook, near saw-mill.	29.870	66		
"	$12\frac{3}{4}$ "	" hill, near brook.	29.351	69		
20	11 A. M.	Woodstock.	29.870	61		
"	noon.	Long Pond, Woodstock.	29.154	68		
"	$6\frac{1}{2}$ P. M.	Rumford Hotel.	29.610	58		
21	7 A. M.	" Wardwell's hotel.	29.722	54		
"	$9\frac{1}{2}$ "	" "	29.71[illegible]	5[illegible]		

"	5½ P. M	" "	29.690	63		Rained.
22	7 A. M.	" "	29.570	62		Thunder shower.
"	1 P. M.	" "	29.510	66		Rainy.
"	6 "	Andover—Virgin's tavern.	29.350	65		
"	11 "	" "	29.370	62		
23	8 A. M.	" "	29.174		19½ ct.	"
"	5 P. M.	" "	29.130	57		
"	8 "	" "	29.180	65		
24	7 A. M.	" "	29.336	40	40	
"	1 P. M.	Road to Letter B township—West's hill, highest on road.	28.050	50 ct.	10 ct.	
"	2 "	Capt. Bragg's—township B.	28.060	50 ct.	10 ct.	
25	7½ "	" "	28.400	2 ct.	2 ct.	
"	7 A. M.	" "	28.580	1½ ct.	1½ ct.	Fair.
"	7½ "	" "	28.590	3 ct.	3 ct.	
"	10½ "	Umbagog Lake—4 ft. above Lake.	29.221	9 ct.	9 ct.	
"	noon	Metalluck point—Umbagog Lake.	29.249	55	12½ ct.	
"	5 P. M.	Megalloway river, 4 feet above the water.	29.260	63		
26	7 A. M.	" Lombard's house.	29.334	8 ct.	8 ct.	
"	8 "	" "	29.300	8 ct.	8 ct.	
"	noon	" "	29.440	16 ct.	16 ct.	
"	4½ P. M.	" 8 ft. above river.	29.420	17½ ct.	17½ ct.	
"	5¾ "	" Capt. Wilson's house.	29.316	15 ct.	15 ct.	
27	10½ A. M.	" "	29.200	15 ct.	15 ct.	

BAROMETRICAL AND THERMOMETRICAL OBSERVATIONS.

Date.	Hour.	Where the Observations were made.	Barometer.	Temp. Bar. T.	Temp. air. t.	Remarks.
Sept. 27	1 P. M.	Megalloway R.—Wilson's house.	29.100	15° ct.	15° ct.	Rained.
"	6½ "	" "	29.064	12 c	12 c	
"	8½ "	" "	29.050	12 c	12 c	
28	7 A. M.	" "	28.966	11¾ c	11¾ c	Rained.
"	11 "	" "	28.960	16 c	16 c	
"	5 P. M.	" Lombard's Landing.	28.984	18 c	18 c	
"	6½ "	" Lombard's house.	28.651	15 c	15 c	
"	9 "	" "	28.816	12 c	12 c	
"	7 A. M.	" "	28.731	14 c	14 c	
29	2 P. M.	Umbagog Lake—4 feet above.	28.800	17 c	17 c	
"	3 "	Township letter B; Bragg's house.	28.300	18 c	18 c	
"	7½ "	" "	28.283	18 c	18 c	Fair—west wind.
30	7 A. M.	" "	28.350			
"	1 P. M.	" "	28.364	17 c	17 c	
"	3 "	" "	28.340	18 c	18 c	
Oct. 1	8½ A. M.	" "	28.520	9 c	9 c	
"	1 P. M.	Andover—Virgin's tavern.	29.550	25 c	25 c	
"	6 "	" "	29.514	17½ c	17½ c	
2	9 A. M.	" "	29.520	11½ c	11½ c	
"	1 P. M.	" "	29.464	26 c	26 c	
"	6 "	" "	29.350	10 c	10 c	Cloudy.

3	7 A. M.	" "	29.176	11°	ct.	11°	ct.	Rained.
4	7 P. M.	Dixfield—Morrill's tavern.	29.584	9	c	9	c	
"	1 "	" "	29.736	13	c	13	c	
"	4 "	Holman's Hill—Dixfield.	29.284	15	c	15	c	
"	7 "	Wilton—Tavern.	29.480	9	c	9	c	
5	7 A. M.	" "	29.330	$8\frac{1}{3}$	c	$8\frac{1}{3}$	c	
"	10 "	" "	29.380	14	c	14	c	
6	$5\frac{1}{3}$ P. M.	Farmington Hotel.	29.250	21	c	21	c	
"	8 "	" "	29.221	18	c	18	c	
7	4 "	" "	29.730	12	c	12	c	
"	10 "	" "	29.820	9	c	9	c	
8	8 A. M	" "	29.800	3	c	3	c	
"	noon	" "	29.750	$10\frac{1}{3}$	c	$10\frac{1}{3}$	c	
"	5 P. M.	Phillips—Whitney's hotel.	29.470	$10\frac{1}{3}$	c	$10\frac{1}{3}$	c	
"	7 "	" "	29.430	1	c	1	c	
9	8 A. M.	" "	29.390	1	c	1	c	
"	noon	French's Mountain—Phillips.	28.446	10	c	10	c	
"	$1\frac{1}{3}$ P. M.	" "	28.410	11	c	11	c	
"	$2\frac{3}{4}$ "	Phillips—Whitney's hotel.	29.380	12	c	12	c	
10	7 A. M	" "	29.450	2	c	2	c	
"	11 "	" "	28.870	9	c	$9\frac{3}{4}$	c	
"	$1\frac{3}{4}$ P. M.	Hill in Madrid.	27.964	7	c	7	c	
"	5 "	Camp under Saddleback Mt.	27.830	$5\frac{1}{3}$	c	$5\frac{1}{3}$	c	Thunder squall; snow and hail, and constant rain—snow on Mt.
11	$10\frac{1}{3}$ A. M.	Phillips Village.	29.334	6	c	6	c	Rain storms.
13	7 "	" "	29.180	$6\frac{1}{3}$	c	$6\frac{1}{3}$	c	Cloudy—N. E. wind.
"	3 P. M.	" "	29.280	8	c	8	c	

BAROMETRICAL AND THERMOMETRICAL OBSERVATIONS.

Date.	Hour.	Where the observations were made.	Barometer.	Temp. Bar. T.	Temp. air. t.	Remarks.
Sept. 15	7 A. M.	Phillips Village.	29.400			
"	3 P. M.	" "	29.200	4° ct.	4° ct.	Rain storm continues.
"	6 "	" "	29.164	5 c	5 c	"
16	7 A. M.	" "	29.360	5 c	5 c	Cleared.
"	11½ "	North Salem—Heath's house.	29.162	9 c	9 c	Fair.
"	1¼ P. M.	Kingfield—Mr. Pike's house.	29.468	10 c	10 c	"
"	6 "	" "	29.550	8 c	8 c	"
"	9 P. M.	" "	29.570	5 c	5 c	"
17	noon.	" "	29.720	15 c	15 c	"
"	7 P. M.	New Portland Hotel.	29.680	10 c	10 c	
18	7 A. M.	" "	29.930	6 c	6 c	
"	11½ "	" "	29.914	8 c	8 c	
"	4⅓ P. M.	Anson Hotel.	30.072	7 c	7 c	
19	7 A. M	"	30.110	2 c	2 c	Overcast—chilly.
"	11 "	"	30.100	4 c	4 c	
Oct. 26	2 P. M.	Union Common.	29.860	11 c	11 c	
27	7 A. M.	Liberty—Light's Corner—Capt. Matthews' house.	29.780	0.5 c	0.5 c	
"	1 P. M.	" "	29.750	9⅓ c	9⅓ c	
28	9 A. M.	" "	29.700	14 c	14 c	
"	5⅓ P. M.	" "	29.590	5 c	5 c	
29	8 A. M.	" "	29.350	4 c	4 c	

TABLE II.

BAROMETRICAL OBSERVATIONS

made at Portland, by Rev. Solomon Adams. *Station* 121.8 *feet above high water mark in Portland harbor.*

Day.--1838.	Hour.	Barom. H.	T.	t.	Wind.	Remarks.
June 1	7	30.20	64	64	S. E.	Foggy.
	1	30.20	66	66	"	Cloudy.
	6	30.19	64	64	S.	Foggy.
2	7	30.09	62	62	S. W.	Gentle rain.
	1	30.	61	61	"	Cloudy.
	6	30.09	63	63	N. W.	Showers P. M.
3	7	30.09	60	60	W.	Clear.
	1	30.06	62	62	N. W.	"
	6	30.02	67	67	"	"
4	7	30.09	62	62	"	Cloudy in the E. and S.
	1	30.07	64	64	S. E.	Showery.
	6	30.05	64	64	"	Overcast.
5	7	29.85	62	62	N. E.	Heavy rain; calm.
	1	29.62	62	62	E.	Mist; moderate wind.
	6	29.58	62	62	N. W.	Cloudy.
6	7	29.60	62	62	N. W.	Clear.
	1	29.81	64	64	S.	"
	6	29.85	65	65	S. W.	Appearance of showers
7	7	29.74	63	63	E.	Steady rain.
	1	29.70	64	64	"	Foggy.
	6	29.60	62	62	"	Rain gentle.
8	7	29.80	60	60	W.	Clear.
	1	29.84	64	64	"	"
	6	30.08	68	68	N. W.	"
9	7	30.27	64	64	"	"
	1	30.29	71	71	W.	"
	6	30.20	70	70	S.	"
10	7	30.19	68	68	S. W.	"
	1	30.20	71	71	S. E.	"
	6	30.10	76	76	S.	"
11	7	30.10	70	70	S. W.	"
	1	30.04	77	77	W.	"
	6	30.02	88	88	"	"
12	7	29.99	77	77	S. W.	Clouds.
	1	30.00	82	82	W.	Clear.
	6	29.99	86	86	"	"
13	7	30.03	74	74	"	"
	1	30.06	81	81	S.	Summer clouds.
	6	30.09	82	82	E.	Slight showers.
14	7	30.17	73	73	"	Broken clouds.
	1	30.19	76	76	"	Cloudy.
	6	30.15	72	72	"	Foggy.

Day.–1838.	Hour.	Barom.	T.	t.	Wind.	Remarks.
June 15	7	30.18	70	70	S. E.	Foggy.
	1	30.15	72	72	"	Clear.
	6	30.08	77	77	N. E.	"
16	7	30.10	74	74	S. W.	Clouds.
	1	30.10	78	78	N. W.	Clear.
	6	30.10	82	82	S. W.	"
17	7	30.01	74	74	"	Overcast.
	1	29.99	76	76	S.	Slight showers.
	6	29.95	77	77	"	Clouds.
18	7	30.02	72	72	N. E.	Cloudy.
	1	30.05	73	73	E.	Clouds.
	6	30.06	72	72	"	"
19	7	30.27	66	66	"	Clear.
	1	30.32	66	66	"	"
	6	30.29	67	67	S.	"
20	7	30.29	62	62	S. W.	"
	1	30.26	66	66	S.	"
	6	30.19	67	67	"	Cloudy.
21	7	30.13	64	64	S. W.	Clear.
	1	30.05	71	71	"	"
	6	29.96	74	74	"	"
22	7	29.98	67	67	N. W.	"
	1	30.05	74	74	S. E.	Clouds.
	6	30.08	72	72	"	Clear.
23	7	30.12	68	68	N. W.	"
	1	30.17	70	70	S. E.	"
	6	30.10	70	70	S.	"
24	7	30.05	69	69	"	Foggy.
	1	30.00	70	70	"	Fog & gentle showers.
	6	29.94	68	68	N. E.	Cloudy.
25	7	29.96	66	66	"	Rain.
	1	29.91	67	67	S. E.	Clouds breaking.
	6	29.87	65	65	E.	Showers.
26	7	29.84	64	64	S. W.	Clear.
	1	29.86	70	70	N. W.	"
	6	29.94	73	73	"	"
27	7	30.16	66	66	"	"
	1	30.19	69	69	S. E.	"
	6	30.18	69	69	"	"
28	7	30.18	66	66	S.	Cloudy.
	1	30.06	67	67	S. E.	Rainy.
	6	29.90	67	67	"	"
29	7	29.85	66	66	S. W.	Clear.
	1	29.89	74	74	N. W.	"
	6	30.00	76	76	N.	"
30	7	30.25	69	69	E.	"
	1	30.30	67	67	"	"
	6	30.28	67	67	"	"

The Thermometer and Barometer, both being in the same exposure, uniformly give the same temperature. Hereafter only the temperature of Barometer will be noted.

y.–1838.	Hour.	Barom.	T.	Wind.	Remarks.
July 1	7	30.28	67	S. E.	Mist.
	1	30.27	67	"	"
	6	30.22	67	"	"
2	7	30.20	67	"	"
	1	30.14	67	E.	Cloudy.
	6	30.08	68	S.	Foggy.
3	7	30.03	67	S. W.	"
	1	30.03	74	S. E.	Signs of showers.
	6	29.99	75	S.	Clear; shower P. M.
4	7	30.06	71	N. W.	Clear.
	1	30.09	80	S. E.	Cloudy and sultry.
	6	30.05	79	"	Hazy.
5	7	30.02	76	N. E.	Cloudy.
	1	30.03	73	S. E.	"
	6	29.94	73	E.	" showers 8 P. M.
6	7	29.98	71	N. W.	Clear.
	1	30.00	76	"	"
	6	30.00	80	N.	"
7	7	30.03	68	N. W.	"
	1	30.01	77	"	"
	6	30.06	80	N.	Showery.
8	7	30.16	72	W.	Clear.
	1	30.16	74	S. E.	"
	6	30.10	74	S.	Cloudy.
9	7	29.95	72	W.	Clear.
	1	29.90	86	"	Clouds and brisk wind.
	6	29.90	82	N. W.	Light showers.
10	7	30.	76	"	Clear.
	1	30.	78	E.	"
	6	29.98	76	S. E.	"
11	7	29.83	74	S. W.	Cloudy.
	1	29.83	84	W.	Clear; showers.
	6	29.86	86	"	" "
12	7	29.94	79	"	Cloudy; "
	1	29.98	77	N. W.	" "
	6	30.04	77	W.	"
13	7	30.19	71	N. E.	"
	1	30.23	71	"	"
	6	30.25	74	S. E.	Clear.
14	7	30.33	68	N. W.	"
	1	30.31	74	S. E.	"
	6	30.28	78	"	"
15	7	30.15	70	S. W.	"
	1	30.09	80	W.	Cloudy.
	6	30.00	80	S. W.	Clouds.
16	7	30.00	76	N.	"
	1	30.00	75	S. E.	Cloudy.
	6	30.00	74	S. W.	Clear.
	7	30.09	67	N.	"
	1	30.11	74	S. W.	"

Day.–1838.	Hour.	Barom.	T.	Wind.	Remarks.
July 17	6	30.17	78	N. W.	Clear.
18	7	30.23	70	"	"
	1	30.18	72	S.	"
	6	30.10	72	"	Cloudy.
19	7	30.04	72	N. W.	Clear.
	1	30.06	78	"	"
	6	30.04	80	"	"
20	7	30.06	70	N.	Clouds.
	1	30.00	71	E.	Cloudy.
	6	29.95	70	N. E.	Showery.
21	7	29.89	68	E.	Rain.
	1	29.90	69	"	Clear.
	6	29.98	69	N. W.	"
22	7	30.14	66	N.	"
	1	30.17	67	N. W.	"
	6	30.18	72	"	"
23	7	30.23	68	N. W.	"
	1	30.26	70	E.	"
	6	30.24	70	S. W.	"
24	7	30.23	68	S. W.	"
	1	30.20	70	S.	"
	6	30.14	70	"	Cloudy.
25	7	30.08	66	S.	Rain—brisk wind.
	1	30.01	66	S. W.	Rainy—brisk wind.
	6	29.98	72	"	Clear.
26	7	29.98	66	N. E.	Foggy.
	1	30.00	70	S. E.	Clear.
	6	30.	71	S. W.	Cloudy.
27	7	30.08	68	N.	Clear.
	1	30.13	70	E.	"
	6	30.11	74	S.	"
28	7	30.10	70	N. W.	"
	1	30.00	76	S. W.	"
	6	29.94	80	"	"
29	7	29.94	76	W.	Clouds.
	1	29.89	82	E.	Clear.
	6	29.85	82	S.	"
30	7	29.75	78	S. W.	Overcast.
	1	29.66	85	W.	Clear—brisk wind.
	6	29.78	85	N. W.	" wind abated.
31	7	29.97	72	S. W.	" calm.
	1	29.97	73	W.	" "
	6	29.93	78	"	"
August 1	7	29.93	69	N. W.	"
	1	29.90	74	S.	"
	6	29.88	77	"	Clouds—showers around us
2	7	30.05	70	N. W.	Clear.
	1	30.10	73	N.	"
	6	30.13	78	N. W.	"
3	7	30.30	73	"	"
	1	30.31	76	S.	"

1838.	Hour.	Barom.	T.	Wind.	Remarks.
Aug. 3	6	30.31	76	S.	Clear.
4	7	30.31	70	S. W.	"
	1	30.23	76	W.	"
	6	30.19	80	"	" smoky.
5	7	30.11	76	N. W.	" "
	1	30.11	81	S. E.	" very dry.
	6	30.04	80	"	Cloudy.
6	7	29.91	74	N. E.	" rain in the night.
	1	29.96	75	S. E.	"
	6	29.95	74	N. E.	"
7	7	30.	70	S. E.	"
	1	30.	70	"	"
	6	30.	76	S.	Clear.
8	7	30.21	70	N. W.	"
	1	30.30	78	"	"
	6	30.27	77	S.	"
9	7	30.28	72		Perfect calm—cloudy.
	1	30.26	74	S.	Cloudy.
	6	30.19	76	"	"
10	7	30.20	71	S. E.	Rainy.
	1	30.20	72	"	Clear.
	6	30.20	71	S.	Cloudy.
11	7	30.19	69	S. E.	Clear.
	1	30.13	70	"	Cloudy.
	6	30.02	70	"	Showers.
12	7	29.85	71	S. W.	Cloudy.
	1	29.88	76	N. W.	Clear.
	6	29.95	80	"	"
13	7	30.06	67	"	"
	1	30.09	74	"	"
	6	30.14	75	"	"
14	7	30.35	65	"	"
	1	30.34	66	"	"
	6	30.31	69	S. W.	"
15	7	30.34	60	N. W.	"
	1	30.31	69	S.	"
	6	30.25	69	"	"
16	7	30.25	65	N. W.	Cloudy.
	1	30.19	68	S.	Gentle rain.
	6	30.05	67	E.	Rain.
17	7	29.66	66	N. W.	Cloudy, (clearing off.)
	1	29.64	70	"	Clear.
	6	29.77	69	"	"
18	7	29.91	64	W.	"
	1	29.98	70	S. E.	"
	6	29.99	70	N.	"
19	7	30.20	62	"	"
	1	30.27	72	"	"
	6	30.30	70	S. W.	"
20	7	30.47	62	N.	"
	6	30.46	60	S. E.	"

Day.–1838.	Hour.	Barom.	T.	Wind.	Remarks.
Aug. 21	7	30.41	60	S.	Light clouds.
	1				Clearing.
	6				Clear.
22	7				"
	1				"
	6				"
23	7	30.34	70	N. W.	"
	1	30.32	78	S. W.	"
	6	30.27	76	"	"
24	7	30.18	70	W.	"
	1	30.10	80	S. W.	Light clouds.
	6	29.99	80	"	Clear.
25	7	30.00	74	N. W.	"
	1	29.95	77	S.	"
	6	29.85	76	"	Light clouds.
26	7	29.80	68	N.	"
	1	29.84	68	"	"
	6	29.91	66	"	Clear and windy.
27	7	30.01	58	W.	Clear.
	6	29.90	60	S. W.	Cloudy.
28	7	29.76	60	N.	Rainy in the night.
	1	29.80	66	N. W.	Clear.
29	7	30.19	61	"	"
	1	30.27	63	S. E.	"
	6	30.24	63	"	Foggy.
30	7	30.14	60	S. E.	Cloudy.
	1	30.04	64	S. W.	Shower—thunder.
31	7	30.19	66		
	1	30.15	68	S.	Clear.
	6	30.07	66	S. W.	Cloudy.
Sept. 1	7	29.88	60	S.	Rainy.
	1	29.80	64	S. E.	"
	6	29.78	64	"	Foggy.
2	7			W.	Clear.
	1	30.00	66	N. W.	"
	6	30.10	64	"	"
6	7	30.39	65	N. E.	"
	6	30.37	68	S. W.	"
7	7	30.26	63	N. W.	"
	1	30.26	75	S. W.	"
	6	30.24	73	"	"
8	7	30.43	65	N. E.	Light clouds.
	1	30.44	66		" "
	6	30.41	62	S. W.	" "
9	7	30.39	59	"	Cloudy.
	1	30.35	61	S.	"
	6	30.30	60	S. W.	Clear.
10	7	30.30	59	"	"
	1	30.16	70	"	"
	6	30.10	68	"	"

1838.	Hour.	Barom.	T.	Wind.	Remarks.
Sept. 11	7	30.09	65	S. W.	Clear.
	1	30.10	68	N. E.	Cloudy.
	6	30.10	68	S. E.	"
12	7	30.22	65	N. E.	"
	1	30.23	64	"	Rainy.
	6	30.19	64	E.	"
13	7	29.78	60	N. E.	Copious rain, and wind.
	1	29.57	61	N.	Drizzly rain.
	6	29.90	63	N. W.	Clear.
14	7	30.30	58	"	"
	1	30.32	63	S.	"
	6	30.28	63	"	"
15	7	30.25	62	N. W.	"
	1	30.30	66	S.	"
	6	30.33	68	"	"
16	7	30.48	62	N. W.	"
	1	30.45	62	S. E.	"
	6	30.38	62	"	"
17	7	30.28	60	N. W.	
	1	30.14	61	S. E.	"
	6	30.10	61	"	"
18	7	29.94	60	N.	Cloudy.
	1	29.89	60	S. E.	"
	6	29.80	60	"	Foggy.
19	7	29.75	60	N. W.	"
	1	29.79	62	"	Clear.
	6	29.86	62	"	"
20	7	30.11	60	S. W.	"
	1	30.14	61	W.	"
	6	30.14	62	S. W.	" chilly.
21	7	30.28	60	N. W.	"
	1	30.30	61	S.	"
	6	30.28	61	S. E.	Rainy.
22	7	30.18	62	S. E.	Foggy.
	1	30.07	63	S.	"
	6	30.07	64	S. W.	Clear.
23	7	29.89	66	"	Foggy.
	1	29.85	68	W.	Showery.
	6	29.80	66	N. W.	"
24	7	30.06	60	N. W.	Clear.
	1	30.04	60	"	"
	6	30.14	60	"	"
25	7	30.40	58	S.	"
	1	30.45	62	"	"
	6	30.50	61	S. W.	"
26	7	30.67	60	N. E.	Cloudy.
	1	30.70	60	E.	"
	6	30.66	60	S. E.	Foggy.
27	7	30.48	59	N. E.	Rainy.
	1	30.40	59	"	"

Day.-1838.	Hour.	Barom.	T.	Wind.	Remarks.
Sept. 27	6	30.35	59	N. E.	Drizzle, drizzle.
28	7	30.29	59	N.	Cloudy.
	1	30.26	62	S. W.	Clear.
	6	30.20	63	"	Cloudy.
29	7	30.10	61	E.	Foggy.
	1	30.02	62	"	Cloudy.
	6	29.98	62	"	Foggy.
30	7	30.01	61	N. W.	Clear.
	1	30.06	64	"	" delightful days.
	6	30.03	66	"	"
Oct. 1	7	30.16	64	"	Clear.
	1	30.19	66	S. E.	"
	6	30.19	66	S. W.	"
2	7	30.19	64	"	" do. do.
	1	30.19	67	S.	"
	6	30.05	67	"	"
3	7	29.90	65	S. W.	Cloudy.
	1	29.87	64	N. W.	"
	6	29.94	63	"	Clear.
4	7	30.16	56	"	"
	1	30.19	56	"	"
	6	30.11	58	S.	"
5	7	29.95	54	S. W.	"
	1	29.95	56	N. W.	"
	6	29.99	59	"	"
6	7	29.93	58	S.	Cloudy.
	1				Absent.
	6				"
7	7	29.87	61	N. W.	Cloudy.
	1	30.03	58	"	Clear.
	6	30.15	56	N.	"
8	7	30.22	52	"	" (first frost.)
	1	30.10	51	S. E.	"
	6	30.07	52	"	"
9	7	29.98	48	N. E.	"
	1	29.99	50	S. E.	"
	6	30.	51	"	"
10	7	30.01	51	S. W.	Cloudy.
	1	30.07	52	E.	"
	6	30.00	54	N. E.	"
11	7	29.67	52	"	Rainy.
	1	29.61	51	S.	Clear.
	6	29.61	52	S. W.	"
12	7	29.95	52	"	"
	1	29.96	53	"	Cloudy.
	6	29.86	54	S. E.	Rainy.
13	7	29.75	52	N. W.	Cloudy.
	1	29.84	52	"	Hazy.
	6	29.95	52	"	Clear.
14	7	29.98	48	W.	Cloudy.

ay.–1838.	Hour.	Barom.	T.	Wind.	Remarks.
Oct. 14	1	29.94	48	S. W.	Cloudy.
	6	29.94	48	W.	"
15	7	29.94	48	N. E.	Rainy.
	1	29.79	48	"	"
	6	29.70	50	N.	Cloudy.
16	7	29.99	48	W.	Clear.
	1	30.06	50	N. W.	"
	6	30.12	50	"	"
17	7	30.23	48	"	"
	1	30.30	48	"	"
	6	30.37	48	"	"
18	7	30.47	48	N.	Cloudy.
	1	30.40	50	S. E.	"
	6	30.38	51	"	"
19	7	30.40	46	N.	"
	1	30.35	46	E.	"
	6	30.24	47	"	Rainy.

TABLE III.

Barometrical Table kept at Kennebunk, (Me.,) by Hon. Daniel Sewall, 1838.

1837.	Thermometer in open air.			Barometer.			Ther. attc'd to Barom.			Wind.	Weather.
	☉ ris.	1 P M	☉ set	☉ rise.	1 P. M.	☉ set.	☉ ris.	1 P M.	☉ set		
Dec. 1	31	43	43	30.30	30.18	30.16	40	41	42	S'y.	Overcast—small rain.
2	36	41	40	16	17	17	41	42	42	S. E.	Rainy—overcast.
3	40	46	44	29.74	29.70	29.72	43	43	44	Calm, W.	Foggy, cl. fair evening, N. Light.
4	35	40	37	30.00	30.00	30.00	40	42	42	W.	Overcast—fair.
5	25	37	33	23	33	31	37	46	41	W. N. W.	Fair.
6	11	37	32	41	36	30	32	39	37	W. S. W.	Fair—cloudy.
7	23	42	36	16	15	10	34	45	41	N. W.	Fair.
8	27	41	31	29.77	29.65	29.65	36	42	39	W.	Cloudy—fair—showers of snow.
9	15	29	22	30.22	30.23	30.20	29	38	34	N. W. N.	Fair—lowery.
10	18	20	22	03	29.85	29.80	29	30	30	N. E.	Snow-storm.
11	19	30	27	29.70	69	69	28	31	31	Calm.	Moderate snow—four or five inches.
12	12	37	22	82	94	93	28	41	36	N. W.	Fair.
13	10	34	38	90	90	94	28	36	33	"	Overcast—fair.
14	–8	23	19	30.00	98	95	22	36	30	"	Fair. } Coldest mornings—8° below zero.
15	–8	25	21	29.99	30.14	30.18	18	31	27	" calm.	Fair. }

16		1	25	18	30.30	31	30	20	33	27	W. N. W.	Fair—lowery.
17	–2		24	22	33	32	31	18	23	23	N. W. calm.	Lowery—overcast.
18		32	39	34	29.72	29.01	28.80	27	31	32	N. E. N.	Rain-storm.
19		27	36	32	59	65	29.65	32	37	36	W. S. W.	Fair—cloudy.
20		18	22	15	67	80	79	32	39	[illegible]	N. W.	Fair.
21		0	22	14	92	99	97	21	33	26	"	"
22	–6		18	14	30.08	30.17	30.15	16	28	23	"	"
23	–1		25	23	39	42	39	16	22	22	N.W.W. S.W.	Cloudy—fair.
24		23	33	31	30	20	14	23	27	28	S. W.	Overcast.
25		12	41	32	20	25	24	26	40	34	W. S. W. S.	Fair.
*26		28	45	41	29.85	29.75	29.75	32	40	37	S. W.	Cloudy—fair.
27		10	26	20	30.44	30.58	30.57	30	38	33	N. W. N.	Fair.
28		17	36	31	32	17	15	28	31	32	S. calm.	Overcast—N. Light.
29		11	44	34	20	19	10	28	39	35	S. W.	Fair—hazy—cloudy.
30		31	44	39	05	05	13	34	36	37	W.	Overcast—fair.
31		32	38	34	30	36	39	35	36	37	Calm.	Overcast.
'38–Jan.1		31	41	37	30.50	30.51	30.50	34	38	38	"	"
2		32	43	39	37	29	25	37	41	40	S. W.	Overcast—cloudy.
3		36	68	50	08	07	07	39	49	46	"	Fair.
4		40	37	36	40	47	47	42	42	42	N. E'y.	Moderate rain-storm.
5		30	40	43	28	05	29.95	39	40	41	S.	Foggy—overcast.
6		39	44	40	15	24	30.30	41	44	43	"	Fair—cloudy.
7		20	42	38	37	27	20	36	42	40	"	Fair.
8		41	44	37	29.90	29.92	10	41	48	44	S. S. W.	Overcast—small rain.

* Mrs. Judith Oaks died at Kennebunk, aged ninety-seven years and seven months.

BAROMETRICAL TABLE KEPT AT KENNEBUNK.

1838.	Spirit Ther. in open air. ☉ ris.	1 P. M.	☉ set	Barometer. ☉ rise.	1 P. M.	☉ set.	Temp. of Barom. ☉ ris.	1 P. M.	☉ set	Wind.	Weather.
Jan. 9	20	25	26	30.50	30.48	40	35	35	34	N. E.	Fair morning—overcast.
10	28	31	24	10	12	12	34	37	34	N.	Cloudy—fair.
11	9	19	16	23	29	28	26	37	29	N. W. N.	Fair.
12	12	30	25	23	36	37	24	36	31	W.	"
13	16	36	33	43	35	32	28	38	34	N. W. S.	"
14	19	40	38	25	12	00	30	33	34	S.	Lowery—sprinkling rain, night.
15	39	44	34	29.60	29.59	29.58	36	48	41	W.	Fair—cloudy—squalls of snow.
16	22	44	42	30.07	30.05	30.00	34	45	35	S. W.	Fair.
17	38	56	53	29.96	29.76	29.73	38	44	48	S. W.	Fair—cloudy—sprinkling rain.
18	33	31	25	30.10	30.10	30.15	43	41	41	N. E.	Overcast—sprinkling snow.
19	29	29	30	29.76	29.46	29.37	42	38	37	N. E.	Overcast—Misty.
20	8	22	18	30.10	30.30	30.33	27	43	32	W'y.	Fair.
21	6	25	23	33	27	23	25	27	28	S. W.	Hazy—lowery.
22	5	20	16	40	46	45	25	31	29	S. N. E.	Fair—lowery.
23	8	31	24	43	45	39	25	41	32	N. S.	" "
24	9	40	36	39	44	42	30	41	36	S. W.	Fair.
25	24	44	35	50	60	59	36	43	40	S. W. S.	Fair—foggy.
26	39	43	42	20	05	08	39	41	42	S.	Moderate rain storm—foggy.
27	32	37	33	42	41	40	39	42	40	N. N. E.	Fair—overcast—snow and rain, night.

Feb. 1		12	28	22	30.28	30.25	30.20	21	25	25	N. E. calm.	Overcast.
2		10	24	15	05	29.95	29.90	24	28	28	N. N. W.	Cloudy—fair.
3		3	25	16	29.89	86	76	22	25	26	N.	Fair—lowery. N. Light.
4		9	27	18	68	68	68	23	29	28	N. N. W.	Fair—cloudy—hazy.
5		3	27	18	68	72	72	23	30	29	N. W.	Fair.
6		4	30	24	94	30.02	30.00	22	28	20	"	Fair—cloudy. [3 inches.
7		3	37	25	30.17	20	12	24	28	20	N. W. S.	Fair; lowery; overcast; snow in night, about
8		23	39	33	29.74	29.70	29.69	22	35	35	N.	Overcast—fair—pleasant—overcast.
9		24	32	28	69	63	59	33	34	34	Calm.	Overcast—misty—small snow.
10		18	28	22	59	65	70	32	33	34	N. W.	Fair—cloudy.
11	−5		33	22	78	79	76	26	29	27	N.	Lowery—overcast—springling snow at night.
12		10	39	19	30.01	30.13	30.14	27	33	32	N. W. W.	Fair.
13		16	48	28	17	20	11	30	34	35	W. S. E.	Fair—lowery—overcast—snow at night,
14		26	37	20	29.89	29.95	30.05	25	38	37	N. N. W.	Overcast—fair. [about 4 inches.
15		4	23	11	30.22	30.17	11	28	29	28	N. Calm.	Overcast—small snow.
16		10	17	13	29.90	29.68	29.43	25	26	26	N. E.	Overcast—storm of snow.
17		2	9	3	84	79	90	23	25	22	N. W. hard.	Fair.
18		2	29	18	87	71	66	18	26	25	N. W. W.	"
19		10	20	13	60	50	44	21	28	26	W. hard.	" [towards morning.
20		9	19	12	57	55	55	19	26	24	N. W. hard.	Fair—clear—no cloud to be seen. N. Light
21		4	23	16	65	69	74	19	26	25	N. W.	Fair—clear. N. Light all night.

BAROMETRICAL TABLE KEPT AT KENNEBUNK.

1838.	Thermometer. ☉ ris.	Thermometer. 1 P. M.	Thermometer. ☉ set	Barometer. ☉ rise.	Barometer. 1 P. M.	Barometer. ☉ set.	Temp. of Barom. ☉ ris.	Temp. of Barom. 1 P. M.	Temp. of Barom. ☉ set	Wind.	Weather.
Feb. 22	7	32	24	95	30.00	98	26	28	29	W.	Fair—some clouds.
23	8	34	24	30.00	29.95	90	24	32	31	N. W.	Fair.
24	9		21	29.88	88	88	26	31	30	N.	Fair—cloudy—fair—cloudy.
25	2	17	13	95	94	89	22	27	25	N. W.	Fair.
26	10	16	9	98	30.03	30.04	18	25	24	"	"
27	13	28	17	30.14	14	10	16	24	25	"	"
28	2	32	28	13	12	08	20	26	28	N.	Fair—lowery.
March 1	22	34	26	30.12	30.13	30.13	27	32	32	N. N. E.	Overcast—cloudy—fair.
2	6	31	28	16	20	22	16	34	33	N. W. N.	Fair—clear.
3	20	34	30	37	44	45	30	27	27	N.	Fair—no cloud to be seen.
4	16	44	28	47	50	43	30	37	37	N. W.	Fair—clear. [Thermometer highest after 1 P. M.—49°]
5	7	39	36	31	20	04	32	34	34	S. E.	Hazy—overcast—rain, evening and night.
6	34	49	42	29.65	29.85	29.98	36	45	43	N. W.	Fair—clear.
7	32	39	32	30.15	30.16	30.16	40	41	40	N. E. E.	Overcast—small rain afternoon.
8	30	34	29	19	18	13	38	39	38	N. E.	Overcast— misty—snow-storm evening and [night.
9	15	38	32	04	10	13	36	38	39	N. E. N. W.	Stormy morning—fair.
10	22	49	36	23	29	24	35	42	42	N. W. S.	Fair.
11	25	57	36	17	10	05	36	40	40	S.	Overcast.
12	26	51	37	05	15	19	38	46	41	N. W. calm.	Fair—clear.

16	34	51	44	29.94	00	30.04	42	46	37	"	Fair.
17	30	43	37	23	32	30	41	43	43	"	Fair—cloudy.
18	31	30	27	20	15	06	40	37	37	"	Overcast—snow
19	28	40	38	29.80	29.69	29.61	35	38	40	N.	Overcast—fair.
20	31	51	42	61	72	79	36	42	43	W.	Fair—cloudy.
21	34	45	36	97	30.14	30.26	39	41	42	N. E. N.N.W.	Overcast—fair.
22	20	44	36	30.47	52	48	38	41	40	N. E. S. E.	Hazy—overcast.
23	31	47	36	42	48	41	39	41	41	N. E. E.	Foggy—overcast.
24	35	66	51	00	29.85	29.91	40	45	47	S. W. W.	Overcast—fair.
25	28	42	37	25	30.23	30.25	40	43	43	N. W.	Fair and clear.
26	22	44	40	25	25	20	38	43	43	N. W. S. E.	Fair.
27	20	36	25	34	32	30	37	39	38	N. E. S. E.	Fair—lowery.
28	14	38	27	28	30	17	34	35	35	E. S.	Fair—cloudy—sprinkling snow.
29	27	44	30	29.71	60	60	34	37	37	S. E.	Moderate snow-storm.
30	24	48	39	55	56	56	35	40	41	W.	Overcast—fair.
31	24	44	37	70	71	68	37	43	43	N. W.	Fair.
April 1	24	41	36	29.70	29.64	29.59	37	40	40	N. W.	"
2	21	43	33	58	53	49	36	41	40	"	"
3	24	42	36	50	50	50	36	41	40	"	"
4	24	50	44	63	70	73	37	43	43	W.	"
5	25	55	40	30.00	30.07	30.09	30	46	46	S.	"
6	28	64	50	05	29.99	00	40	49	49	W.	Fair—hazy—overcast.

BAROMETRICAL TABLE KEPT AT KENNEBUNK.

1833.	Thermometer. ☉ ris.	1 P. M.	☉ set.	Barometer. ☉ rise.	1 P. M.	☉ set.	Temp. of Barom. ☉ ris.	1 P. M.	☉ set.	Wind.	Weather.
Feb. 22	7	32	24	95	30.00	98	26	28	29	W.	Fair—some clouds.
23	8	34	24	30.00	29.95	90	24	32	31	N. W.	Fair.
24	9		21	29.88	88	88	26	31	30	N.	Fair—cloudy—fair—cloudy.
25	2	17	13	95	94	89	22	27	25	N. W.	Fair.
26	10	16	9	98	30.03	30.04	18	25	24	"	"
27	13	28	17	30.14	14	10	16	24	25	"	"
28	2	32	28	13	12	08	26	26	28	N.	Fair—lowery.
March 1	22	34	26	30.12	30.13	30.13	27	32	32	N. N. E.	Overcast—cloudy—fair.
2	6	31	28	16	20	22	16	34	33	N. W. N.	Fair—clear.
3	20	34	30	37	44	45	30	27	27	N.	Fair—no cloud to be seen.
4	16	44	28	47	50	43	30	37	37	N. W.	Fair—clear. [Thermometer highest after 1 P. M.—49°]
5	7	39	36	31	20	04	32	34	34	S. E.	Hazy—overcast—rain, evening and night.
6	34	49	42	29.65	29.85	29.98	36	45	43	N. W.	Fair—clear.
7	32	39	32	30.15	30.16	30.16	40	41	40	N. E. E.	Overcast—small rain afternoon.
8	30	34	29	19	18	13	38	39	38	N. E.	Overcast—misty—snow-storm evening and [night.
9	15	38	32	04	10	13	36	38	39	N. E. N. W.	Stormy morning—fair.
10	22	49	36	23	29	24	35	42	42	N. W. S.	Fair.
11	25	57	36	17	10	05	36	40	40	S.	Overcast.
12	26	51	37	05	15	19	38	46	41	N. W. calm.	Fair—clear.

16		1	25	18	30.30	31	30	20	33	27	W. N. W.	Fair—lowery.
17	-2		24	22	33	32	31	18	23	23	N. W. calm.	Lowery—overcast.
18		32	39	34	29.72	29.01	28.80	27	31	32	N. E. N.	Rain-storm.
19		27	36	32	59	65	29.65	32	37	36	W. S. W.	Fair—cloudy.
20		18	22	15	67	80	79	32	39	3[illegible]	N. W.	Fair.
21		0	22	14	92	99	97	21	33	28	"	"
22	-6		18	14	30.08	30.17	30.15	16	28	23	"	"
23	-1		25	23	39	42	39	16	22	22	N.W.W.S.W.	Cloudy—fair.
24		23	33	31	30	20	14	23	27	28	S. W.	Overcast.
25		12	41	32	20	25	24	26	40	34	W. S. W. S.	Fair.
*26		28	45	41	29.85	29.75	29.75	32	40	37	S. W.	Cloudy—fair.
27		10	26	20	30.44	30.58	30.57	30	38	33	N. W. N.	Fair.
28		17	36	31	32	17	15	28	31	32	S. calm.	Overcast—N. Light.
29		11	44	34	20	19	10	28	39	35	S. W.	Fair—hazy—cloudy.
30		31	44	39	05	05	13	34	36	37	W.	Overcast—fair.
31		32	38	34	30	36	39	35	36	37	Calm.	Overcast.
'38–Jan.1		31	41	37	30.50	30.51	30.50	34	38	38	"	"
2		32	43	39	37	29	25	37	41	40	S. W.	Overcast—cloudy.
3		36	68	50	08	07	07	39	49	46	"	Fair.
4		40	37	36	40	47	47	42	42	42	N. E'y.	Moderate rain-storm.
5		30	40	43	28	05	29.95	39	40	41	S.	Foggy—overcast.
6		39	44	40	15	24	30.30	41	44	43	"	Fair—cloudy.
7		20	42	38	37	27	20	36	42	40	"	Fair.
8		41	44	37	29.90	29.92	10	41	48	44	S. S. W.	Overcast—small rain.

* Mrs. Judith Oaks died at Kennebunk, aged ninety-seven years and seven months.

BAROMETRICAL TABLE KEPT AT KENNEBUNK.

1838.	Thermometer. ris.	Thermometer. 1 P. M.	Thermometer. set	Barometer. rise.	Barometer. 1 P. M.	Barometer. set.	Temp. of Barom. ris.	Temp. of Barom. 1 P. M.	Temp. of Barom. set	Wind.	Weather.
Feb. 22	7	32	24	95	30.00	98	26	28	29	W.	Fair—some clouds.
23	8	34	24	30.00	29.95	90	24	32	31	N. W.	Fair.
24	9		21	29.88	88	88	26	31	30	N.	Fair—cloudy—fair—cloudy.
25	2	17	13	95	94	89	22	27	25	N. W.	Fair.
26	10	16	9	98	30.03	30.04	18	25	24	"	"
27	13	28	17	30.14	14	10	16	24	25	"	"
28	2	32	28	13	12	08	20	26	28	N.	Fair—lowery.
March 1	22	34	26	30.12	30.13	30.13	27	32	32	N. N. E.	Overcast—cloudy—fair.
2	6	31	29	16	20	22	16	34	33	N. W. N.	Fair—clear.
3	20	34	30	37	44	45	30	27	27	N.	Fair—no cloud to be seen.
4	16	44	28	47	50	43	30	37	37	N. W.	Fair—clear. [Thermometer highest after 1 P. M.—49°]
5	7	39	36	31	20	04	32	34	34	S. E.	Hazy—overcast—rain, evening and night.
6	34	49	42	29.65	29.85	29.98	36	45	43	N. W.	Fair—clear.
7	32	39	32	30.15	30.16	30.16	40	41	40	N. E. E.	Overcast—small rain afternoon.
8	30	34	29	19	18	13	38	39	38	N. E.	Overcast—misty—snow-storm evening and [night.
9	15	38	32	04	10	13	36	38	39	N. E. N. W.	Stormy morning—fair.
10	22	49	36	23	29	24	35	42	42	N. W. S.	Fair.
11	25	57	36	17	10	05	36	40	40	S.	Overcast.
12	26	51	37	05	15	19	38	46	41	N. W. calm.	Fair—clear.

13	17	42	32	31	33	31	38	43	41	S. E.	Fair—foggy.
14	24	48	38	29	28	23	38	42	43	Calm.	Foggy morning—fair.
15	37	51	47	10	00	29.93	40	44	46	N. E.	Cloudy—lowery—fair.
16	34	51	44	29.94	00	30.04	42	46	37	"	Fair.
17	30	43	37	23	32	30	41	43	43	"	Fair—cloudy.
18	31	30	27	20	15	06	40	37	37	"	Overcast—snow
19	28	40	38	29.80	29.69	29.61	35	38	40	N.	Overcast—fair.
20	31	51	42	61	72	79	36	42	43	W.	Fair—cloudy.
21	34	45	36	97	30.14	30.26	39	41	42	N. E. N.N.W.	Overcast—fair.
22	20	44	36	30.47	52	48	38	41	40	N. E. S. E.	Hazy—overcast.
23	31	47	36	42	48	41	39	41	41	N. E. E.	Foggy—overcast.
24	35	66	51	00	29.85	29.91	40	45	47	S. W. W.	Overcast—fair.
25	28	42	37	25	30.28	30.25	40	43	43	N. W.	Fair and clear.
26	22	44	40	25	25	20	38	43	43	N. W. S. E.	Fair.
27	20	36	25	34	32	30	37	39	38	N. E. S. E.	Fair—lowery.
28	14	38	27	28	30	17	34	35	35	E. S.	Fair—cloudy—sprinkling snow.
29	27	44	30	29.71	60	60	34	37	37	S. E.	Moderate snow-storm.
30	24	48	39	55	56	56	35	40	41	W.	Overcast—fair.
31	24	44	37	70	71	68	37	43	43	N. W.	Fair.
April 1	24	41	36	29.70	29.64	29.59	37	40	40	N. W.	"
2	21	43	33	58	53	49	36	41	40	"	"
3	24	42	36	50	50	50	36	41	40	"	"
4	24	50	44	63	70	73	37	43	43	W.	"
5	25	55	40	30.00	30.07	30.09	30	46	46	S.	"
6	28	64	50	05	29.99	00	40	49	49	W.	Fair—hazy—overcast.

BAROMETRICAL TABLE KEPT AT KENNEBUNK.

1838.	Thermometer.			Barometer.			Temp. of Barom.			Wind.	Weather.
	☉ ris.	1 P. M.	☉ set	☉ rise.	1 P. M.	☉ set.	☉ ris.	1 P. M.	☉ set		
7	26	48	38	15	18	18	43	47	46	W. S.	Fair.
8	20	50	39	23	29	22	41	46	45	S.	Fair—rain, night.
9	40	55	49	29.73	63	60	43	46	47	"	Overcast—fair.
10	33	50	38	63	63	66	43	46	45	S. W. N. W.	Overcast—sprinkling rain—fair.
11	26	42	35	91	97	90	41	43	42	S. E.	Fair—overcast—misty—snow.
12	31	50	38	30.00	30.10	30.11	40	44	43	N. S.	Fair. N. Light.
13	30	57	42	15	16	17	39	45	46	W.	Fair—overcast—snow, night.
14	25	34	30	23	17	13	41	41	41	N. E.	Snow-storm.
15	12	47	39	13	02	29.92	36	40	41	N. W.	Fair.
16	17	32	28	06	16	30.18	36	38	37	"	Fair and clear.
17	17	45	36	32	30	22	33	39	38	N. W. S.	Fair—lowery—small snow, night
18	31	52	45	29.95	29.80	29.78	38	41	42	S.	Overcast—small rain, night.
19	41	49	44	66	64	64	43	45	45	N.	Overcast—misty.
20	30	44	32	85	30.00	30.12	41	44	43	N. W.	Fair.
21	19	39	34	30.23	26	12	38	41	41	S.	Fair and clear.
22	31	54	50	29.92	29.75	29.69	40	46	47	"	Fair.
23	27	47	37	98	30.05	30.05	43	45	45	N. W. N. S.	"
24	18	33	30	30.23	23	19	37	41	40	N. S.	"
25	16	45	8	23	24	20	36	41	42	N. W. S.	"

	26	30	49	38	18	13	00	39	40	41	S. E.	Overcast—misty—foggy.
	27	36	62	51	29.73	29 74	29.91	40	47	49	S.	Overcast—fair.
	28	32	65	46	93	96	91	45	51	51	W. S.	Fair—cloudy.
	29	42	53	40	85	86	82	48	49	48	N. E.	Overcast. N. Light.
	30	34	55	41	86	95	30.09	43	48	47	W. N. W.	Fair. N. Light.
May	1	28	61	55	30.20	30.19	30.15	43	49	51	N. W.	Fair and clear.
	2	30	53	47	19	15	10	47	53	52	N. E. S.	Fair—lowery.
	3	42	47	44	29.95	29.95	2 .94	49	49	49	N. E.	Overcast—small rain.
	4	40	46	40	96	30.09	30.13	47	46	46	"	Overcast.
	5	38	42	38	30.15	10	00	45	44	43	"	Overcast—rain-storm—plentiful rain, night.
	6	41	58	42	29.90	29.90	29.92	44	46	47	N. E. E.	Overcast—fair—foggy.
	7	40	55	52	82	86	85	46	51	52	S.	Overcast—foggy—fair.
	8	36	59	47	8	92	90	49	54	52	"	Fair—cloudy.
	9	38	61	45	88	89	87	48	52	52	N. E. S.	Cloudy—fair.
	10	41	58	43	8	93	94	49	52	52	E. S. E.	Cloudy—fair—foggy.
	11	40	63	50	96	96	95	47	51	52	Variable.	Fair—some clouds and few drops of rain.
	12	32	62	48	95	84	88	46	52	51	S.	Fair.
	13	37	59	52	86	88	99	49	54	54	W. S.	Fair—frost, night.
	14	31	62	49	30.16	30.25	30.25	50	55	53	N. E. S.	Fair—bright N. Light—frost.
	15	3[illegible]	66	58	31	31	24	48	57	53	N. W. S.	Fair.
	16	50	85	59	1	00	29.96	54	58	59	W. S. W.	Fair—hazy—smoky—sprinkling rain.
	17	56	77	62	29.89	29.91	96	59	65	65	W.	Fair.
	18	42	40	42	90	88	90	58	52	51	N. E. N.	Rain-storm.
	19	27	50	4	97	30.00	96	45	50	50	S.	Fair.
	20	47	77	59	95	87	90	50	56	60	S. W. S.	"

BAROMETRICAL TABLE KEPT AT KENNEBUNK.

1838.	Thermometer.			Barometer.			Temp. of Barom.			Wind.	Weather.
	☉ ris.	1 P M	☉ set	☉ rise.	1 P. M.	☉ set.	☉ ris.	1 P M.	☉ set		
May 21	46	66	50	30.02	12	30.12	56	62	60	N. E. E.	Fair.
22	47	67	56	14	11	04	56	58	58	E. S.	Rain, morning—overcast—foggy.
23	40	79	56	07	17	12	58	63	63	S.	Fair—cloudy.
24	52	72	57	29.92	29.93	29.86	57	63	61	"	Foggy—overcast—fair—cloudy.
25	54	62	53	87	89	81	50	60	57	E. N. E.	Overcast—misty.
26	47	58	48	79	86	87	55	55	55	S.	Cloudy—fair.
27	33	62	51	92	93	92	51	56	57	E. S.	Fair.
28	46	66	54	87	87	88	53	58	57	S.	Rain, morning—fair.
29	43	67	57	95	30.01	30.07	53	60	59	"	Fair.
30	46	56	56	30.10	14	09	54	57	58	N. E.	Foggy—overcast—cloudy.
31	52	78	62	09	10	10	56	63	64	N. E.	Cloudy—fair.
		82									
June 1	48	75	53	30.17	30.20	30.19	59	63	59	E. S.	Foggy—cl.—overcast—foggy—some rain, [night.
2	50	64	60	09	03	04	57	58	60	S.	Overcast—shower—fair.
3	49	78	63	06	05	04	56	61	62	W.	Fair.
4	50	69	50	05	07	00	56	60	60	N. E. S. E.	Fair—cloudy.
5	54	59	59	29.87	29.68	29.68	59	59	59	N. E. N.	Rain-storm.
6	50	79	62	69	79	81	57	66	62	W. S.	Fair—shower.

*7	51	64	56	71	64	60	61	62	61	E. S.	Rain, morning—overcast—shower—thun-
†8	52	76	68	74	85	30.04	57	63	64	W. fresh.	Fair. [der—brilliant rainbow.
9	50	88	68	30.19	30.26	20	59	67	66	S. W.	Fair.
‡10	54	86	78	18	19	10	60	72	70	"	Fair—small shower, night.
11	63	98	87	11	08	08	68	77	81	"	Fair.
12	71	96	82	04	04	03	73	81	79	W.	"
13	67	97	79	03	05	10	71	80	77	"	"
14	66	78	64	13	15	17	70	73	70	E.	Fair—small shower.
§15	49	82	82	16	16	10	67	72	75	E. S. S. E.	Foggy—fair.
**16	60	94	73	11	14	10	70	79	72	S. W.	Fair.
17	64	92	70	03	03	29.97	70	76	69	S.	Cloudy—fair—thunder-shower.
18	63	72	61	29.98	30.04	30.04	68	68	69	N. E.	Overcast—misty—fair—cloudy.
19	46	69	57	30.20	34	34	61	64	68	N. E. S.	Fair.
20	47	75	63	33	31	22	58	61	65	S.	"
21	52	81	77	18	14	04	61	70	73	S. W. S.	"
††22	67	82	66	00	07	09	69	73	68	N. E. E. S.	Fair—small shower.
23	55	79	62	12	16	14	63	68	65	N. E. E.	Fair.
24	59	70	66	09	02	29.98	64	66	68	S. variable.	Foggy—overcast—shower.
25	55	69	57	30.00	00	91	64	64	64	S. E.	Overcast—thunder-shower.
26	54	80	68	29.90	29.90	30.00	62	69	70	W. fresh.	Fair. N. Light.
27	51	80	65	30.13	30.20	20	64	68	68	E.	Fair—lowery.
28	53	62	62	21	10	29.93	63	65	65	S. S. E.	Cloudy—rainy

* Thermometer highest, after 1. P. M., 80°
† " " forenoon, 77
‡ " " after 1 P. M., 80
‡ " " " 88

‖ Thermometer highest, after 1 P. M., 101°
§ " " forenoon, 87
** " " after 1 P. M., 98
†† " " forenoon, 92

BAROMETRICAL TABLE KEPT AT KENNEBUNK.

1838.		Thermometer.			Barometer.			Temp. of Barom.			Wind.	Weather.
		☉ ris.	1 P. M.	☉ set	☉ rise.	1 P. M.	☉ set.	☉ ris.	1 P. M.	☉ set		
June	29	64	86	69	29.87	29.91	30.04	64	74	71	W. fresh.	Fair.
	30	50	75	61	30.20	30.31	29	61	67	66	S. E.	"
July	1	[illegible]	68	62	30.29	30.30	30.25	66	65	65	S.	Small rain—foggy.
	2	60	82	70	19	18	11	66	67	68	"	Foggy—overcast—fair—thunder-shower.
	3	57	87	75	08	06	05	65	72	71	"	Fair.
	4	6[illegible]	95	77	05	10	10	67	77	75	S. W. S.	"
	5	66	90	77	08	08	00	69	76	75	S. E.	Fair—cloudy—lightning, evening.
	6	62	85	72	29.99	03	05	66	74	76	N. W. fresh.	Fair.
	7	57	89	57	30.07	06	06	65	76	74	"	"
	8	50	80	69	12	16	10	64	74	70	S.	"
	9	67	98	[illegible]5	29.97	29.94	29.90	68	82	82	S. S. W.	"
	10	69	91	72	96	30.01	30.00	72	76	70	S.	"
	11	66	102	84	88	29.82	29.83	70	80	81	S. W.	Fair—shower, afternoon.
	12	73	88	75	90	30.00	30.06	75	75	73	W. N. W.	Cloudy—fair.
	13	66	77	65	30.16	24	28	70	69	66	W. N. E. S. E.	Overcast—fair.
	14	49	86	72	31	37	29	62	76	72	W. S. W. S.	Fair.
	15	63	97	80	18	12	06	68	77	76	S.	Fair—cloudy.
	16	66	85	70	00	00	02	70	74	69	"	" "
	17	60	85	68	04	11	15	66	71	70	S. W.	Fair.

19	62	92	72	04	04	03	68	74	73	W. N. W.	Fair.
20	52	81	62	04	02	29.92	65	69	67	N. N. E. S.	Fair; showers; thunder; rain, night.
21	60	76	65	29.89	29.90	95	66	67	67	N.E.W. N.W.	Overcast; fair.
22	49	80	64	30.10	30.16	30.19	64	67	68	N. W. N. S.	Fair.
23	48	83	66	22	24	24	63	69	68	N. W. S.	"
24	51	80	65	24	23	15	61	66	66	S.	Fair; lowery; overcast; rain, night.
25	61	69	67	10	02	29.93	64	65	66	"	Mod. storm; fair; N. Light.
26	57	82	68	29.98	00	30.00	65	70	69	"	Foggy—fair.
27	52	83	68	30.04	13	12	64	72	67	W. S.	Fair.
28	58	90	81	08	02	29.93	66	75	77	S.	Fair—small shower.
29	66	97	76	29.94	29.90	86	71	81	76	"	Fair—[Ther. highest, 29th, forenoon, 102°.]
30	71	98	74	77	70	79	72	83	78	S.S.W. N. W.	Fair; N. Light.
31	68	84	70	94	96	96	66	71	71	N. W.	Fair.
Aug. 1	47	84	76	29.95	29.89	29.88	66	76	76	S. W. S.	"
2	52	88	66	30.03	30.10	30.14	66	71	72	N. S.	"
3	59	85	67	25	32	32	66	71	67	N. W. S.	"
4	49	95	82	33	27	20	64	76	78	S. W.	"
5	30	98	43	14	14	10	70	81	74	S.	"
6	67	78	67	29.92	29.94	29.96	72	72	69	N'ly.	Overcast.
7	63	77	69	30.00	30.02	30.00	68	68	70	S. W.	Overcast—fair.
8	60	87	72	20	30	29	67	72	72	N. W. N. S.	Fair.
9	60	75	69	29	25	20	67	69	70	Calm. S.	Overcast—small rain, evening.
10	61	80	66	18	20	20	68	70	69	N. E. E.	Overcast—fair. [11 h. forenoon 80°.
11	56	74	64	20	12	03	66	68	67	N. E. E. S.	Fair—overcast—rain.—[Therm. highest at

BAROMETRICAL TABLE KEPT AT KENNEBUNK.

1838.		Thermometer.			Barometer.			Temp. of Barom.			Wind.	Weather.
		☉ ris.	1 P. M.	☉ set	☉ rise.	1 P. M.	☉ set.	☉ ris.	1 P. M.	☉ set		
Aug.	12	66	85	76	29.88	29.90	29.98	67	73	73	W.	Foggy —fair.
	13	56	82	70	30.05	30.11	30.16	65	71	70	"	Fair.
	14	18	74	62	34	37	35	64	66	66	N.	"
	15	40	76	66	36	35	28	60	67	66	N. E. S.	Fair—lowery.
	16	50	69	59	22	18	05	62	65	65	S.	Overcast—rain storm, afternoon.
	17	59	80	69	29.66	29.66	29.77	64	70	69	N. N. W.	Rain—fair.
	18	56	78	65	92	30.00	30.03	65	68	68	N. W. W.	Fair.
	19	48	82	62	30.19	27	30	62	67	65	N. W. E. S.	"
	20	49	74	71	41	48	47	62	67	66	N. E. S. E.	"
	21	60	78	67	45	40	35	61	66	65	S. E.	Cloudy and fair.
	22	55	86	72	33	36	35	64	73	72	N. W. S.	Fair and clear. Aurora Borealis.
	23	55	86	75	34	33	26	64	76	73	W. S.	Fair—smoky.
	24	62	100	77	20	12	05	68	80	77	S. W.	Fair—smoky—hazy.
	25	64	92	73	05	01	29.90	72	79	70	W. S.	" small shower.
	26	60	70	57	29.80	29.86	96	69	66	66	N.	" shower—frost in some places.
	27	38	72	56	30.02	30.02	30.00	58	62	61	N. N. W. W.	" cloudy—rain, night.
	28	55	77	67	29.80	29.81	29.92	59	65	67	W.	" Aurora.
	29	39	73	59	30.17	30.26	30.25	59	64	64	N. E. S.	"
	30	50	63	67	21	05	07	60	64	66	S. N.	" thunder shower. Aurora.

31	48	75	63	18	17	12	60	65	65	N. W. S.	Fair.
Sept. 1	57	65	59	29.69	29.80	29.79	60	63	63	S. calm.	Moderate rain-storm—foggy.
2	59	65	55	90	30.04	30.14	56	62	63	W.	Fair—frost.
3	32	68	54	30.31	38	37	56	60	60	N. W. N. S.	" "
4	40	71	51	41	39	35	55	51	62	N. S.	Fair.
5	42	83	73	32	28	23	56	67	71	S.	" [Thermom. highest at 3 P. M.—86°]
6	47	74	53	35	43	36	62	67	66	N. W. S.	"
7	43	92	72	30	29	28	59	75	70	Calm. S.	"
8	54	68	54	42	46	45	64	64	62	N. E. E.	Hazy—cloudy—fair.
9	50	69	59	42	39	34	57	62	63	S.	Overcast—fair.
10	52	84	69	26	19	11	58	66	68	"	Fair.
11	55	80	66	10	10	12	65	70	63	S. E.	Fair—cloudy.
12	54	57	51	23	23	22	61	61	59	N. E.	Overcast—small rain—stormy night.
13	53	58	61	29.82	29.62	29.93	57	58	61	N. E. N. N.W.	Stormy—cloudy—fair. Aurora B.
14	46	74	61	30.27	30.35	30.32	57	66	65	W. S.	Fair. Aurora.
15	45	81	64	26	31	35	59	60	60	N. W. N. E. S.	" "
16	44	68	54	47	48	42	61	64	64	N. W. N. E.	" "
17	42	71	57	28	17	10	57	60	60	N. E.	Hazy—fair. Aurora.
18	46	77	58	29.98	29.90	29.83	57	62	62	Varia.—calm.	Foggy—overcast—some sunshine—sun [eclipsed, partly visible.
19	57	73	61	74	77	90	60	65	65	W.	Fair—clear.
20	37	75	58	30.12	30.16	30.16	57	62	63	S.	Fair. Aurora.
21	36	74	59	26	30	27	57	60	59	"	Fair—cloudy—hazy—rain at night.
22	62	72	66	18	11	07	61	65	65	"	Overcast—cloudy—fair.
23	62	64	58	29.93	29.89	29.83	64	66	66	"	Foggy—sunshine and clouds—rainy even'g.
24	36	57	57	30.05	30.04	30.15	53	60	59	W.	Fair.

BAROMETRICAL TABLE KEPT AT KENNEBUNK.

1838.	Thermometer. ☉ ris.	Thermometer. 1 P. M.	Thermometer. ☉ set	Barometer. ☉ rise.	Barometer. 1 P. M.	Barometer. ☉ set.	Temp. of Barom. ☉ ris.	Temp. of Barom. 1 P. M.	Temp. of Barom. ☉ set	Wind.	Weather.
Sept. 25	32	68	60	40	47	50	53	63	50	S.	Fair.
26	50	59	52	66	71	69	56	58	57	N. N. E.	Overcast—small rain.
27	51	58	54	48	42	38	57	59	59	N. E.	Moderate rain-storm.
28	52	66	57	30	25	24	58	61	61	S. S. E.	Overcast—cloudy—fair—cloudy.
29	55	70	60	10	03	01	59	59	59	Calm.	Overcast—small rain—foggy. Aurora.
30	50	76	68	02	04	04	58	66	66	W.	Fair.
Oct. 1	47	84	66	30.16	30.22	30.22	59	70	68	N. W.	Fair—clear.
2	43	73	62	20	18	10	57	68	65	S.	" "
3	57	64	55	29.90	29.90	29.93	62	63	63	S. W.	Overcast—sprinkling rain—fair.
4	36	62	52	30.13	30.20	30.16	55	59	57	N. W. S.	Fair.
5	48	72	64	29.97	29.98	00	54	65	61	N. W. W.	"
6	38	79	63	95	83	29.78	55	71	65	S. W.	Fair—small rain, night.
7	50	58	46	80	30.06	30.17	60	61	57	N. W.	Fair.
8	29	54	45	30.24	13	10	50	54	53	N. E. calm.	Fair—white frost.
9	27	59	46	01	02	02	47	53	52	N. S.	Fair.
10	36	58	46	01	03	02	48	50	51	N. E.	Cloudy—overcast—rain-storm, night.
11	46	64	53	29.66	29.65	29.65	50	54	54	S.	Cleared off fair—cloudy.
12	39	54	51	96	97	84	51	52	52	"	Fair—overcast—rain-storm.
13	41	53	43	80	84	93	51	53	52	W.	Cleared off fair.

31	48	75	63	18	17	12	60	65	65	N. W. S.	Fair.
Sept. 1	57	65	59	29.89	29.80	29.79	60	63	63	S. calm.	Moderate rain-storm—foggy.
2	59	65	55	90	30.04	30.14	60	62	63	W.	Fair—frost.
3	32	68	54	30.31	38	37	56	60	60	N. W. N. S.	" "
4	40	71	51	41	39	35	55	61	62	N. S.	Fair.
5	42	83	73	32	28	23	56	67	71	S.	" [Thermom. highest at 3 P. M.—86°]
6	47	74	63	35	43	36	62	67	66	N. W. S.	"
7	43	92	72	30	29	28	59	75	70	Calm. S.	"
8	54	68	54	42	46	45	64	64	62	N. E. E.	Hazy—cloudy—fair.
9	50	69	59	42	39	34	57	62	63	S.	Overcast—fair.
10	52	84	69	26	19	11	58	66	68	"	Fair.
11	55	80	66	10	10	12	65	70	68	S. E.	Fair—cloudy.
12	54	57	51	23	23	22	61	61	59	N. E.	Overcast—small rain—stormy night.
13	53	58	61	29.82	29.62	29.93	57	58	61	N. E. N. N.W.	Stormy—cloudy—fair. Aurora B.
14	46	74	61	30.27	30.35	30.32	57	66	65	W. S.	Fair. Aurora.
15	45	81	64	26	31	35	59	60	60	N. W. N. E. S.	" "
16	44	68	54	47	48	42	61	64	64	N. W. N. E.	" "
17	42	71	57	28	17	10	57	60	60	N. E.	Hazy—fair. Aurora.
18	46	77	58	29.98	29.90	29.83	57	62	62	Varia.—calm.	Foggy—overcast—some sunshine—sun [eclipsed, partly visible.
19	57	78	61	74	77	90	60	65	65	W.	Fair—clear.
20	37	75	58	30.12	30.16	30.16	57	62	63	S.	Fair. Aurora.
21	36	74	59	26	30	27	57	60	59	"	Fair—cloudy—hazy—rain at night.
22	62	72	66	18	11	07	61	65	65	"	Overcast—cloudy—fair.
23	62	64	58	29.93	29.89	29.83	64	66	66	"	Foggy—sunshine and clouds—rainy even'g.
24	36	37	57	30.05	30.04	30.15	55	60	59	W.	Fair.

BAROMETRICAL TABLE KEPT AT KENNEBUNK.

1838.	Thermometer.				Barometer.			Temp. of Barom.			Wind.	Weather.
		☉ ris.	1 P M	☉ set	☉ rise.	1 P. M.	☉ set.	☉ ris.	1 P M.	☉ set.		
Nov. 8		47	52	53	16	29.92	29.89	43	45	46	S.	Rain storm.
9		44	48	39	29.70	85	93	50	51	56	S. W. W.	Overcast—fair.
10		23	34	28	30.37	30.56	30.67	41	43	42	N. W.	Fair.
11		11	39	29	95	96	96	36	39	39	N. W. N. S.	" Aurora.
12		20	17	40	77	59	52	36	41	41	S.	" bright Aurora, ev'g.*
13		35	46	47	36	25	20	40	42	43	"	Overcast.
14		49	62	54	13	20	23	45	53	52	S. W. W.	Fair—pleasant—Aurora.
15		31	38	39	39	39	30	46	45	45	N. E.	Moderate rain storm.
16		36	42	44	03	29.83	29.80	15	15	15	Calm.	Overcast—foggy.
17		30	37	32	20	30.27	30.29	11	44	13	N. W.	Fair.
18		19	36	29	40	33	27	37	38	37	N. E.	Lowery—overc.—snow at night, about 8 in.
19		26	41	28	29.91	06	16	36	42	41	W.	Fair.
20		8	42	29	30.16	10	16	32	39	39	W. S. W.	" cloudy.
21		20	10	30	16	14	11	33	40	40	W.	"
22		32	42	31	29.87	29.85	29.90	37	39	39	"	Cloudy—overcast—fair.
23		13	35	27	30.01	30.01	30.01	34	35	34	"	" fair.
24		7	20	7	03	10	13	32	33	32	W. N. W.	Fair—clear.
25	–8		42	16	16	14	12	22	28	28	N. W.	Fair.
26	–2		39	20	12	15	15	23	29	29	"	"

27	13	37	22	15	06	03	25	26	27	Calm.	Overcast.	
28	24	40	31	29.96	29.95	29.95	29	32	33	N. W.	"	fair.
29	1	27	24	30.12	30.10	30.07	28	30	31	"	Fair	
30	21	16	30	01	29.99	29.99	30	36	36	W.	"	

11th, at 10h forenoon Barometer 30.97, highest for many years.

* Center of Aurora about 10° E. of true North.

CORRECTIONS IN LAST YEAR'S PUBLICATION.

June 3. Column of Barometer. For 30.17—30.02—29.88, read 30.02—29.88—29.72.

" 23. Column of Thermometer. For 64°, read 54°.

July 29. Column of Barometer. Sunrise—For 30.12, read 30.02.

August 18. Column of Weather. For fair, cloudy, fair, read fair, cloudy, foggy.

September 18. Column of Thermometer. For 76°, read 74°.

October 19. " " For 56°, read 46°.

" 10. Column of Barometer. For 30.50, read 30.60.

" 22. " " For 30.3c, read 30.30.

November 29. Merc. Thermometer temperature, sunrise. For 38, read 33.

TABLE IV.

BAROMETRICAL TABLE, kept at Waterville. By Professor G W. Keely.

[Commenced June 2.]

1838	7 h. A. M.			10 h. A. M.			Noon.			5 h. P. M.		
Day	h. Eng. in.	T centig.	t centig	h	T	t	h	T	t	h	T	t
2	29.96	* 16.67	*15.	29.94	* 16.33	* 13.33	29.89	*16.	*13.	29.88	*15.5	* 15.33
S	29.9	15.5	14.	29.91	18.	18.25	29.89	18.	18.75	29.86	19.	21.
4	29.94	15.	13.5				29.92	19.5	22.5	29.88	19.5	21.33
5	29.74	16.	15.	29.64	16.	13.75	29.53	16.	14.5	29.43	16.5	15.5
6	29.53	16.5	17.				29.64	20.	26.	29.68	21.5	24.5
7	29.63	18.	14.5	29.6	18.5	16.	29.57	18.5	16.67	29.45	18.	16.5
8	29.58	16.	16.	29.63	17.	20.	29.67	17.5	21.	29.79	17.5	[illegible]
9	30.08	16.5	19.67	30.11	20.	25.	30.09	21.	26.	30.04	22.67	27.
S	30.07	20.5	22.	30.07	23.3	29.	30.05	24.	31.5	29.98	28.5	32.
11	29.95	22.5	23.5	2			29.93	27.	29.5	29.87	28.5	33.5
12	29.87	23.5	25.75	29.87	24.	30.	29.87	27.	31.5			
13	29.90	23.5	24.75	29.93	26.	29.	29.95	26.	28.3	29.98	25.5	27.25
14	30.08	21.	20.25	30.08	22.	26.	30.06	23.	28.	30.03	24.	27.25
15				30.03	22.5	28.	30.02	25.3	30.5	29.98	25.	23.03
16	29.96	22.	23.67	29.97	25.	29.5	29.98	26.	33.	29.93	27.	30.5
S	29.92	23.	21.5				29.86	24.	28.5	29.83	23.	23.25
18	29.93	18.5	18.5	29.95	19.67	24.	29.94	21.	23.			
19	30.17	16.67	16.67				30.17	20.67	22.			
20	30.15	17.	14.	30.15	20.	23.	30.14	22.5	27.	30.07	24.	26.5
21	30.02	19.67	18.5	29.97	23.	27.	29.94	25.5	30.3	29.86	26.	28.5
22	29.91	23.5	25.	29.96	21.5	24.5	29.97	23.	25.5	29.94	24.5	29.
23	30.03	18.5	17.	30.04	21.	26.				29.98	22.5	25.5
S	29.97	18.	16.	29.93	19.	17.	29.89	20.	18.75	29.88	19.	16.
25	29.86	17.	15.	29.86	19.	17.25	29.83	19.5	20.67	29.79	18.5	18.
26				29.73	20.5	25.	29.73	21.67	25.5	29.79	22.	22.5
27	30.05	18.5	28.5	30.07	20.5	25.	30.06	22.5	25.75			
28	30.05	18.	17.	30.04	20.	22.	30.02	19.5	19.67	29.86	19.	17.5
29	29.72	18.	18.33	29.77	20.	25.	29.79	21.5	25.75			
30				30.19	20.5	22.5	30.19	21.33	23.33			
1	30.18	18.	20.	30.18	19.	20.	30.18	19.5	20.	30.14	19.5	18.5
2	30.06	19.	19.3	30.06	19.5	21.5	30.03	20.5	25.	29.96	22.	24.(a)
3	29.94	21.	21.67				29.92	24.5	28.	29.87	26.	28.5
4	29.97	22.5	23.67	29.98	29.	32.5	29.97	27.5	34.67	29.95	27.5	30.67
5	29.96	22.	23.5	29.96	23.	25.67	29.93	24.	28.67	29.86	22.5	23.33
6	29.87	21.5	23.	29.87	24.	28.	29.86	24.5	28.	29.87	24.	25.3
7	29.89	20.	21.3				29.89	25.	29.3	29.92	24.	25.3
S	30.04	20.	22.				30.02	24.5	27.25	29.96	23.	24.67
9	29.8	22.	22.	29.78	24.	28.	29.78	26.5	31.5	29.73	27.3	29.67
10	29.89	22 5	24.	29.9	24.	29.3	29.89	24.5	31.5	29.85	25.	26.3

(a.) At 6 P. M. the last.

1838	7 h. A. M.			10 h. A M.			Noon.			5 P. M.		
Day	Barom	T	t	Barom	T	t	Barom	T	t	Barom	T	
11	29.71	21.	22.	29.68	25.	30.	29.68	26.5	32.3	29.68	27.3	31.
12	29.85	24.	23.67	29.86	24.	25.5	29.88	24.67	29.75	29.93	25.	27.67
13				30.14	20.	23.	30.15	25.5	24.	30.13	22.5	24.5
14	30.21	18.	16.5	30.25	21.	27.	30.19	24.	28.			
8	30.03	21.5	25.5	29.99	24.	29.3	29.95	26.	32.	29.86	26.	29.3
16	29.89	21.5	23.	29.89	23.67	28.	29.89	25.	27.	29.86	25.67	28.
17	29.98	20.	19.				30.1	23.	25.3	30.03	23.67	25.5
18	30.13	18.	16.5	30.09	21.3	27.	30.06	24.	28.	29.96	23.5	26.3
19	29.91	21.	24.	29.92	23.	25.	29.89	23.	26.5	29.88	24.5	26.5
20	29.93	18.5	19.5	29.9	20.	25.5						
(Sept.) 7	30.15	17.	17.5				30.15	24.	24.	30.15	25.5	27.5
8	30.39	17.	13.				30.39	18.	18.			
9												
10	30.11	16.	16.	30.08	19.	20.	30.04	20.	23.			
11	29.96	20.	19.	30.01	21.	23.3	30.03	21.				
12	30.20	16.5	13.	30.20	19.	18.	30.18	18.	17.			
13							29.56	16.	13.5	29.73	18.	15.5
14	30.18	16.	15.	30.23	18.	22.	30.22	20.	23.5	30.17	21.	21.3
15	30.17	14.	12.3									
16	30.41	15.	8.	30.41	17.	15.5	30.39	18.5	18.	30.30	19.	18.
17	30.15	13.5	7.5	30.08	16.	18.5	30.06	19.	21.	29.96	19.5	20.
18				29.83	15.	17.5	29.78	18.	22.	29.72	18.	19.
19				29.67	18.66	18.	29.68	19.5	18.			
20	29.97	13.5	10.5	29.99	16.5	16.66	30.02	18.	21.5	30.02	19.	20.
21	30.04	17.5	18.5	30.17	16.	15.5	30.17	19.	22.5	30.17	19.	20.
22							29.98	20.5	23.5			
23												
24	29.9	14.	9.	29.87	15.	13.5	29.89	15.5	14.			
25	30.32	10.	6.5	30.35	12.	13.5	30.36	14.5	16.	30.38	16.	18.5
26	30.63	13.	9.	30.64	15.	13.5	30.62	17.	16.5			
27	30.40	14.5	12.	30.35	15.	15.						
28	30.17	15.	15.	30.15	17.	18.5				30.08	18.	20.
29							29.91	19.5	20.66	29.88	19.75	21.
30	29.94	17.5	15.5	29.96	20.	20.	29.94	21.5	22.	29.9	20.5	22.5
(Oct.) 1	30.04	16.3	12.	30.08	19.5	22.3	30.08	21.3	25.	30.05	21.	23.5
2	30.08	15.5	8.5	30.07	18.5	18.	30.03	22.5	21.	29.93	22.	23.
3	29.74	17.	17.66				29.74	17.5	16.3			
4	30.04	12.	5.				30.04	13.5	12.5	29.96	15.	14.
5	29.78	12.5	12.	29.81	15.	17.66	29.81	15.5	19.	29.84	16.	18.
6	29.80	12.	5.5				29.64	16.	21.33			
7	29.73	16.	9.5							30.03	14.3	9.
8	30.11	8.	-3.5	30.1	11.	7.	30.05	13.	9.5	29.93	12.	9.3
9	29.87	6.5	-2.	29.88	9.5	6.3						
10							29.95	10.5	14.5	29.93	11.	11.
11	29.59	11.	9.5	29.50	11.	12.5	29.47	12.3	18.	29.49	15.	14.5
12				29.83	13.	13.5	29.84	14.	15.	29.79	12.	10.66
13	29.63	10.33	7.5							29.77	10.5	8.
14	29.84	6.	0.5				29.78	6.	6.	29.79	6.5	6.

183c	7 h. A. M.			10 h. A. M.			Noon.			5 h. P. M.		
Day	Barom	T	t	Barom	T	t	Barom	T	t	Barom	T	t
15				29.83	7.	5.3	29.77	7.	6.	29.58	7.5	6.5
16	29.82	7.5	3.5				29.92	11.5	12.5			
17	30.08	7.	2.	30.12	9.	9.3						
18	30.34	5.	-1	30.33	10.3	7.	30.33	13.	8.3	30.28	14.5	8.
19	30.33	7.	-5	30.32	9.5	6.3	30.29	12.	8.	30.22	12.	4.5
20				29.56	14.0	8.	29.59	14.	8.5			
21	29.76	9.3	2.5	29.77	12.5	11.				29.79	11.	8.3
22	29.88	8.5	4.5	29.91	13.5	8.3	29.93	14.5	10.06	29.97	15.5	7.3
23	30.21	9.	-1	30.24	11.5	6.66	30.24	15.3	8.5	30.19	14.	8.
24	30.03	10.	5.	29.97	12.5	8.	29.78	13.	10.3			
25	29.61	10.	5.	29.60	12.	7.5	29.57	13.	7.5	29.58	13.	7.
26				29.82	12.5	7.5	29.85	14.5	12.			
27							29.95	10.	11.3			
28	29.85	9.5	2.				29.83	14.5	10.5			
29	29.46	9.3	3.3	29.55	14.	5.5	29.58	14.	6.			
30	29.87	5.3	-3	29.91	8.5	3.	29.93	11.	3.			
31				29.99	4.5	-0.66	29.97	4.5	0.			

Where no sign is prefixed to the temperature, + is meant.

TABLE V.

ROMETRICAL TABLE, kept at Brunswick, Me. By Professor PARKER CLEAVELAND.

ay.—1838.	H. 7 A.M.	H. 1 P.M.	15 m. after ☉ set.	Day.—1838.	H. 7 A.M.	H. 1 P.M.	15 m. after ☉ set.
May 21	29.80	29.95	30.00	June 22	29.89	29.88	29.88
22	30.00	29.93	29.80	23	29.96	29.96	29.96
23	29.90	29.98	30.00	24	29.90	29.90	29.90
24	29.74	29.72	29.70	25	29.90	29.81	29.80
25	29.70	29.70	29.70	26	29.80	29.80	29.83
26	29.67	29.69	29.71	27	30.01	30.01	30.01
27	29.77	29.77	29.77	28	30.01	30.00	29.85
28	29.70	29.70	29.70	29	29.68	29.70	29.80
29	29.80	29.80	29.80	30	30.10	30.10	30.11
30	29.80	29.80	29.91	July 1	30.11	30.11	30.00
31	29.91	29.91	29.91	2	29.98	29.90	29.90
June 1	30.00	30.00	29.92	3	29.98	29.98	29.98
2	29.91	29.85	29.85	4	29.99	29.99	29.99
3	29.85	29.85	29.85	5	29.91	29.91	29.91
4	29.87	29.87	29.87	6	29.83	29.83	29.83
5	29.86	29.85	29.85	7	29.88	29.88	29.89
6	29.68	29.51	29.51	8	30.00	30.00	29.91
7	29.51	29.51	29.45	9	29.78	29.78	29.78
8	29.51	29.61	29.71	10	29.83	29.84	29.84
9	30.06	30.06	30.06	11	29.70	29.70	29.76
10	30.00	30.00	30.00	12	29.77	29.77	29.81
11	30.00	29.88	29.88	13	30.03	30.03	30.03
12	29.84	29.84	29.84	14	30.17	30.17	30.17
13	29.86	29.90	29.90	15	30.00	29.93	29.84
14	30.02	30.02	30.02	16	29.84	29.84	29.86
15	30.02	30.02	29.92	17	29.90	29.95	29.95
16	29.96	29.96	29.96	18	30.10	30.03	30.00
17	29.83	29.83	29.83	19	29.87	29.87	29.87
18	29.86	29.86	29.90	20	29.87	29.84	29.84
19	30.09	30.13	30.23	21	29.80	29.80	29.80
20	30.12	30.12	30.12	22	29.98	30.00	30.00
21	29.98	29.91	29.91	23	30.03	30.04	30.03

Day.—1838.	H. 7 A.M.	H. 1 P.M.	15 m. after ☉ set.	Day.—1838.	H. 7 A.M.	H. 7 P.M.	15 m. after ☉ set.
July 24	30.08	30.08	30.08	Sept. 2	29.73	29.88	29.90
25	29.98	29.98	29.96	3	30.06	30.16	30.16
26	29.96	29.95	29.95	4	30.22	30.22	30.22
27	29.91	29.95	29.95	5	30.13	30.10	30.09
28	29.95	29.85	29.85	6	30.24	30.24	30.24
29	29.77	29.73	29.73	7	30.11	30.11	30.16
30	29.60	29.61	29.64	8	30.21	30.21	30.22
31	29.80	29.80	29.80	9	30.25	30.25	30.19
August 1	29.80	29.80	29.86	10	30.08	30.00	30.00
2	29.90	29.93	29.93	11	29.91	29.90	29.90
3	30.15	30.15	30.15	12	29.91	29.91	29.92
4	30.15	30.00	30.00	13	29.67	29.47	29.80
5	29.96	29.96	29.90	14	29.94	29.96	29.96
6	29.79	29.78	29.78	15	30.10	30.10	30.12
7	29.83	29.85	29.85	16	30.31	30.31	30.31
8	30.08	30.10	30.10	17	30.10	30.10	30.10
9	30.12	30.12	30.03	18	29.80	29.75	29.75
10	30.03	30.05	30.05	19	29.66	29.60	29.60
11	30.05	29.96	29.85	20	29.85	29.85	29.90
12	29.70	29.70	29.80	21	30.11	30.11	30.10
13	29.90	29.91	30.10	22	30.00	30.00	30.00
14	30.10	30.20	30.20	23	29.73	29.70	29.65
15	30.20	30.15	30.12	24	29.75	29.75	29.85
16	30.05	30.01	29.87	25	30.25	30.30	30.30
17	29.51	29.51	29.62	26	29.90	29.90	29.96
18	29.66	29.71	29.71	27	29.83	29.85	29.85
19	30.05	30.10	30.10	28	30.13	30.13	30.06
20	30.19	30.29	30.29	29	29.93	29.87	29.87
21	30.25	30.15	30.15	30	29.87	29.87	29.87
22	30.14	30.05	30.05	Oct. 1	29.86	29.86	29.86
23	30.05	30.05	30.05	2	29.84	29.84	29.84
24	30.00	30.00	29.87	3	29.72	29.72	29.83
25	29.87	29.87	29.87	4	29.99	29.99	29.98
26	29.68	29.68	29.85	5	29.76	29.76	29.76
27	29.85	29.83	29.83	6	29.74	29.74	29.74
28	29.76	29.76	29.80	7	29.72	29.68	30.05
29	30.04	30.04	30.04	8	30.05	30.05	30.05
30	30.03	29.91	29.91	9	29.83	29.83	29.84
31	30.01	30.01	30.01	10	29.86	29.91	29.91
Sept. 1	29.76	29.70	29.70	11	29.52	29.52	29.55

Day.—1838.	H. 7 A.M.	H. 1 P.M.	15 m. after ☉ set.	Day.—1838.	H. 7 A.M.	H. 1 P.M.	15 m. after ☉ set.
Oct. 12	29.78	29.81	29.81	22	29.83	29.90	29.90
13	29.81	29.84	29.89	23	30.16	30.16	30.10
14	29.89	29.89	29.89	24	30.00	29.87	29.87
15	29.80	29.62	29.62	25	29.77	29.77	29.77
16	29.84	29.91	29.98	26	29.78	29.80	29.80
17	30.08	30.12	30.12	27	29.99	29.99	29.94
18	30.20	30.28	30.28	28	29.91	29.80	29.75
19	30.26	30.21	30.20	29	29.58	29.58	29.63
20	29.86	29.86	29.80	30	29.84	29.84	29.84
21	29.72	29.72	29.72	31	29.91	29.91	29.98

TABLE VI.

Professor CLEAVELAND's Table of the quantity of RAIN which fell at Brunswick from 1808 to 1818.

	1808. inches.	1809. inches.	1810. inches.	1811. inches.	1812. inches.	1813. inches.	1814. inches.	1815. inches.	1816. inches.	1817. inches.	1818. inches.	Monthly means. inches.
January,	2.000	3.500	3.000	1.900	2.500	3.500	.750	2.272	2.800	5.300	2.500	2.729
February,	1.900	2.300	3.000	4.100	4.300	2.200	1.800	1.500	2.820	4.010	1.710	2.695
March,	.800	1.200	5.500	1.500	1.006	5.010	2.700	1.157	1.830	2.000	3.700	2.400
April,	3.033	1.500	3.000	2.100	4.500	1.990	4.932	3.155	1.320	2.138	2.300	2.724
May,	6.854	2.928	2.770	4.300	4.401	2.743	11.410	1.800	4.153	.510	5.800	4.334
June,	4.514	3.600	2.889	2.000	7.730	2.128	3.660	4.751	1.410	5.090	3.174	3.722
July,	5.019	3.470	2.992	4.990	5.020	2.650	3.650	1.490	1.600	2.155	2.976	3.276
August,	.569	2.481	3.579	3.610	3.690	2.144	7.314	3.020	2.130	3.350	.155	2.913
September,	3.432	3.051	1.384	.510	1.000	.673	5.065	6.212	.300	2.150	5.070	2.622
October,	4.091	2.150	1.403	2.623	4.577	6.068	.540	2.232	6.165	2.550	.200	2.963
November,	3.607	1.659	4.470	7.470	3.292	6.065	3.976	1.670	5.664	4.800	1.500	4.016
December,	7.045	6.011	1.201	1.300	1.500	1.450	3.000	2.410	.200	4.233	2.000	2.760
Totals,	42.894	33.850	35.188	36.403	43.510	36.621	48.797	31.669	30.392	38.286	31.085	37.154*

* Annual average for eleven years.

NOTE.—May, 1814, was a remarkable month. Nearly one half of the quantity of rain fell during one week of almost continued storm. The rise of the Androscoggin was nearly unprecedented, and productive of much damage. In addition to this rainy week, there were nine thunder showers during the month.

TABLE VII.

BAROMETRICAL REGISTER kept at the State House, Augusta. By J. B. Cahoon, Esq.—1838.--Bar. 1.

Date.	9 A. M.		Noon.		5 P. M.		Observations.
	Barom.	T	Barom.	T	Barom.	T	
June 29	29.769	72°	29.771	72°	29.880	71°	Fair—fleecy clouds—wind S. W.
30	30.200	69	30.209	69	30.200	66	Clear—wind S. E.
July 2	30.160	68	30.150	68	29.950	70	Cloudy—E. S. E.
3	29.920	71	29.920	73	29.872	74	Fog in morning—fair at 9—light clouds, noon—W.—at 3,
4	29.980	70	29.980	70	29.981	71	Fair, half past 4 P. M. [rain—at 5, clear.
5	29.950	75	*29.900	76	29.876	75	9, appearance of rain—wind S. W.—showers.
6	29.969	75	29.870	76	29.870	74	9, fair—wind N. W.—12, high wind, light clouds—5, same.
7	29.900	74	29.900	75	29.900	75	Fair at 9, wind W.—Fair at 12, wind N.—4, high wind, rain.
9	29.770	76	29.770	76	29.750	78	9, wind S., cloudy—sun obscured most of the day—wind
10	29.892	78	29.900	75	29.869	76	9, light clouds, wind S. W.—5, light clouds. [S. W. at 5.
11	29.700	77	29.680	80	29.690	79	Light fleecy clouds, wind S. W.—showers.
12	29.850	75	29.880	75	29.912	75	Wind S. W., rainy, stormy.
13	30.130	70	30.130	70	30.130	72	Wind N. W., cloudy—5, clear.
14	30.250	72	30.220	74	30.150	76	Wind S. W., clear.
16	29.900	72	29.950	73	29.880	75	Wind W., showers—5, wind S. W., light fleecy clouds.
17	30.000	73	30.000	71	30.020	73	Wind S. W., clear.
18	30.170	74	30.160	75	30.000	74½	S. fleecy clouds.
19	29.930	74	29.900	73			Fleecy clouds.
20	29.950	71	29.970	71	29.870	69	" "

* 20 minutes before 3.

BAROMETRICAL REGISTER KEPT AT THE STATE HOUSE, AUGUSTA.

Date.	9 A. M.		Noon.		5 P. M.		Observations.
	Barom.	T	Barom.	T	Barom.	T	
21	29.800	69°	29.800	69°	29.800	69°	Rainy.
23	30.170	69	30.170	71	30.120	71	Clear.
24	30.120	69	30.120	70	31.000	71	Wind S., cloudy.
25	29.964	68	29.930	68	29.870	66	Rainy day—11, wind S. E.
26	29.900	68	29.900	69	29.880	71	Wind N. E., fair—12, wind N. W.
27	30.000	72	30.000	72	30 000	74	Wind W., hazy.
Aug. 13	29.980	73	29.980	72	30.000	71	" " clear.
14	30.250	67	30.230	68	30.210	68	Wind N. W., clear—5, fleecy clouds.
15	30.226	70	30.210	71	30.150	70	Wind W., hazy.
16	30.100	69	39.076	71	30.000	70	9, fog—1, commenced raining, wind S.
17	29.500	67	29.500	69	29.550	70	Rainy at 9—fair at 12.
18	29.820	70	29.820	69	29.850	68*	Wind W., hazy.
20	30.370	68	30.370	68	30.328	68	Wind N., clear.
21	30.300	67	30.300	69	30.250	69	" S., cloudy.
22	30.250	70	30.250	73	30.200	74	Light clouds, wind W.
23	30.210	72	30.200	73	30.150	76	Wind S. W., fair.
24	30.020	75	29.980	78	29.900	78	Wind S., fleecy clouds—rain at 5, wind S. W.
25	29.900	77	29.886	76	29.800	76	Wind S. W., light clouds—some rain.
27	29.900	64	29.888	76	29.820	76	Wind W., fair.
28	29.700	76	29.700	76	29.760	66	Wind W., light clouds—rain at 5.
29	30.128	65			30.128	67	Wind W., light clouds.
30	30.050	65	30.000	66	29.928	66	Wind S., flying clouds—rain at 12—showers.
31	30.050	66	30.050	64	30.000	65	Wind W., fleecy clouds.
Sept. 1	29.770	63	29.728	64	29.672	64	Wind S. W.—rain at 7 P. M.
3	30.230	63	30.230	62	30.230	62	Wind W.—light clouds—at 5, wind N. W.

6	30.300	66			30.226	68	" W., fair.
7	30.176	68	30.170	71			" S. W., light clouds.
8	30.384	65	30.400	67	30.350	65	" N., fleecy clouds.
10	30.112	64	30.050	66	26.950	66	" S. W., hazy.
11	29.990	66	29.990	66	30.026	68	" S. W., cloudy.
12	30.170	64	30.170	64	30.130	64	" N. cloudy.
13	29.700	64	29.550	66	29.672	67	" N. E., heavy rain at 9—wind N. W., 12 o'clock—[wind W., 5.
14	30.218	66	30.218	66	30.180	66	" W., fair—wind at 5, S. W.
15	30.180	64	32.000	66	30.218	66	" N., fair.
17	30.150	61	30.080	63	29.968	63	At 9, fog.
18	29.880	62	29.800	68	29.726	66	Wind S. E.—fog—at 12, cloudy—sun obscured all day.
19	29.630	66	29.650	65	29.688	62	" N. W., clear.
20	30.000	62	30.000	63	30.000	62	Clear, wind S. W.
21	30.180	60	30.178	62	30.156	62	S. E., fleecy clouds, A. M.—cloudy, P. M.
22	30.016	62	30.000	63	29.918	65	S. W., thick, misty, A. M.—clear, P. M.
24	29.900	65	29.900	64	29.970	64	S. W., cloudy.
25	30.350	59	30.368	64	30.376	62	Clear.
26	30.616	60	30.620	64	30.550	62	Fleecy clouds.
27	30.372	59	30.350	62	30.276	63	E. S. E., rainy
28	30.162	62	30.130	65	30.080	65	Cloudy, N. W.
29	29.966	62	29.934	65	29.868	65	Cloudy, A. M.,—S. E.—Clear, P. M.
Oct. 1	30.050	65	30.050	65	30.050	66	Clear.
2	30.070	65	30.032	66	29.934	66	Clear, N. W.
3	29.718	62	29.718	64	29.816	64	Rainy, A. M.—changeable, P. M.
4	30.064	60	30.070	60	29.980	58	

* 4 o'clock.

TABLE VIII.

BAROMETRICAL and THERMOMETRICAL REGISTER, kept at Gardiner, by R. H. GARDINER, Esq. From 1st of June to 1st of November, 1838.

1838.	8 A. M.			3 P. M.			10 P. M.		
	Barom	Ex Thr	Winds.	Barom	Ex Thr	Winds.	Barom	Ex Thr	Winds.
June 1	30.	67	S. E.	29.98	73	S S W	29.97	57	S W
2	29.90	52	"	29.84	55	S W	29.85	52	Calm
3	29.85	61	N. W.	29.83	65	N W	29.85	52	"
4	29.86	63	Calm.	29.85	68	S W	29.83	55	S W
5	29.66	55	N. E.	29.45	58	N E	29.45	56	Calm
6	29.50	68	N. W.	29.—			29.67	60	"
7	29.56	56	N. E.				29.47	53	"
8	29.56	64	W.	29.70	66	N W	29.86	57	N W
9	30.03	69	N. W.	29.98	83	W N W	29.96	60	S W
10	29.98	68	Calm.	29.94	83	S W	29.93	69	Calm
11	29.88	74	S. W.	29.81	85	"	29.80	72½	S W
12	29.78	78	Calm.	29.78	91½	N W	29.78	70½	W
13	29.81	80	N. W.	29.84	81	"	29.92	68	S W
14	29.97	67	E. N. E.	29.95	78	S E	29.93	62	S E
15	29.95	68	S. E.	29.90	81	S	29.88	66	S W
16	29.88	76	"	29.87	90	N	29.84	70½	N W
17	29.82	70	Calm.	29.77	80	S E	29.76	65	S W
18	29.83	65	N. E.	29.83	74	E	29.88	58	"
19	30.06	64	S. E.	30.08	67	S E	30.05	51	"
20	30.07	60	S. S. E.	30.—	73	S S E	29.99	58	S
21	29.92	67	S.	29.84	76	S W	29.76	64	S W
22	29.82	76	N.	29.85	78	Calm	29.87	59	Calm
23	29.93	66	"	29.90	78	N W	29.90	60	S W
24	29.86	59	S. E.	29.80	62	E S E	29.80	58	N E
25	29.79	58	N. E.	29.73	66	"	29.70	57½	S E
26	29.685	67	S. E.	29.70	74	N	29.82	60	S W
27	29.98	67	N.	29.96	81	W S W	29.98	58	"
28	29.95	68	S. W.	29.84	60	S E	29.71	59	"
29	29.65	69	W. S. W.	29.72	76	N E	29.86	59	N W
30	30.07	65	S. E.	30.08	73	S E	30.09	55	S S W
July 1	30.07	62	"	30.05	65	"	30.03	59	S E
2	29.96	63	E. S. E.	29.88	74	S	29.87	64	S
3	29.84	70	S.	29.79	78	W	29.82	68	Calm
4	29.85	75	Calm.	29.88	90	S W	29.86	69	"
5	29.85	75	E.	29.80	78	S S W	29.76	67	"
6	29.78	70	N. N. W.	29.78	78	N W	29.80	64	N N W
7	29.80	76	N.	29.81	83	N	29.88	63	Calm
8	29.93	69	S. W.	29.90	71	S	29.84	66	S by W
9	29.73	73	S.	29.66	88	N N W	29.70	75	W S W
10	29.79	78	N.	29.79	84	W N W	29.79	68	W
11	29.74	78	W. S. W.	29.61	84	S W	29.64	73	S E

838.	8 A. M. Barom	Ex. Thr	Winds.	3 P. M. Barom	Ex Thr	Winds.	10 P. M. Barom	Ex Thr	Winds.
uly 12	29.74	73	N W	29.77	79	S W	29.88	68	S W
13	29.98	67	"	30.01	74	Calm	30.05	58½	"
14	30.10	68	Calm	30.05	83	W N W	30.02	64	"
15	29.92	73	S W	29.80	82	W S W	29.78	72	W S W
16	29.80	72	N E	29.79	82	W N W	29.80	62	Calm
17	29.90	70	N	29.90	76	N	29.98	58	"
18	30.02	71	E	29.92	76	W S W	29.85	68	S S E
19	29.82	75	N N E	29.82	81	N W	29.85	60	W N W
20	29.85	66	N	29.80	69	S E	29.78	58	S W
21	29.73	59	S E	29.72	71	N W	29.81	59	N W
22	29.93	64	N N E	29.94	72	N E	29.99	58	"
23	30.03	64	N	30.02	76	Calm	30.02	58	S W
24	30.02	65	Calm	29.80	74	W	29.94	63	S S W
25	29.88	58	S W	29.82	65	S S W	29.79	64	S E
26	29.79	67	N	29.79	78	N	29.83	61	Calm
27	29.88	71	"	29.90	82	W S W	29.90	64	S
28	29.87	73	Calm	29.78	86	"	29.84	72	Calm
29	29.72	74	"	29.70		Calm	29.66	73	"
30	29.53	77	S	29.44	82	N W	29.62	66	N W
31	29.72	64	W N W	29.70	75	N N W	29.72	63	Calm
ug. 1	29.73	68	S	29.79	79½	S	29.56	66	S W
2	29.84	73	N N E	29.88	76	N	29.98	64	Calm
3	30.08	69	N	30.08	81	Calm	29.99	64	W S W
4	30.00	72	S S E	29.99	86	S S W	29.95	68	Calm
5	29.92	76	Calm	29.89	88	N	29.85	70	"
6	29.76	68	E	29.76	73	Calm	29.78	64	"
7	29.79	66	W S W	29.79	70	"	29.84	65	W S W
8	30.03	69	N N E	30.04	80	N	30.05	63	Calm
9	30.06	69	Calm	30.—	76	S	30.00	64	S
10	29.99	67	S W	29.98	80½	S W	29.99	62	Calm
11	29.97	67	S	29.88	67	S E	29.78	63	S E
12	29.68	72	S E	29.73	78	N W	29.79	61	Calm
13	29.83	68	N W	29.84	79	"	29.99	60	"
14	30.03	65	N	30.01	71	N	30.12	56	"
15	30.12	64	Calm	30.04	76	W	30.03	58	"
16	29.99	70½	S W	29.92	63	S	29.79	55	S E
17	29.46	64	Calm	29.46	72	W N W	29.59	60	N N W
18	29.72	69	N N W	29.76	74	N	29.86	51	Calm
19	30.00	66	N	30.04	72	"	30.11	51	"
20	30.24	72	E	30.22	71	W S W	30.24	53	"
21	30.20	62	W	30.19	71	S	30.12	60	"
22	30.11	69	S	30.09	83	N	30.09	66	"
23	30.10	72	Calm		88	S	30.01	67	"
24	29.92	79	S S W	29.82	86	S S W	29.80	68	"
25	29.80	78	S W	29.76	81	S S E	29.65	69½	"
26	29.64	69	N E	29.68	65	N N W	29.78	50	N N W
27	29.80	55½	N W	29.75	68½	W N W	29.73	56	W S W
28	29.64	60	N E	29.66	71½	N W	29.81	55	W N W
29	30.02	60½	"	30.04	66½	S E	30.07	53	S S W
30	29.96	58	S E	29.84	71	N N W	29.93	55	N N W

1838.	8 A. M. Barom	8 A. M. Ex Thr	8 A. M. Winds.	3 P. M. Barom	3 P. M. Ex Thr	3 P. M. Winds.	10 P. M. Barom	10 P. M. Ex Thr	10 P. M. Winds.
Aug. 31	29.97	66	N	29.92	68	N W	29.—	54	Calm
Sept. 1	29.72	58	S	29.64	59	S S E	29.65	58	S W
2	29.71	59	W S W	29.84	59½	N W	30.03	45	N W
3	30.11	51	N	30.14	63½	N N E	30.19	45½	N
4	30.21	50	"	30.14	65	N	30.12	48	Calm
5	30.09	64	Calm	30.07	79½	N W	30.07	59	"
6	30.20	64	N N E	30.15	76	Calm	30.10	54	"
7	30.07	65	Calm	30.04	84	N	30.11	66	"
8	30.27	64	N	30.245	62	N E	30.25	52	"
9	30.19	56	Calm	30.13	64	S W	30.12	52	W S W
10	30.03	59	S W	29.92	73	S	29.87	62½	S W
11	29.90	64	Calm	29.92	73	N	30.04	58	N
12	30.07	58	N E	30.07	64	N E	30.04	55	N E
13	29.66	54	N W	29.49	59	N	29.90	54	Calm
14	30.10	63	Calm	30 09	71	S W	30.08	54	"
15	30.08	72	"	30.12	73	N N E	30.20	52	"
16	30.29	70	N N E	30.22	66½	S	30.17	47	"
17	30.05	47	Calm,	29.92	68	S S W	29.88	47	"
18	29.76	51½	"	29.67	64	"	29.65	56	"
19	29.58	59	North	29.64	63	N	29.78	48	"
20	29.91	54	South	29.90	63	S W	30.03	51	"
21	30.17	51	Calm	30.08	67	S	30.07	58	"
22	29.98	64	S S W	29.87	71	"	29.84	65	S W
23	29.71	66	S W	29.64	67	N E	29.66	54	N W
24	29.82	49	"	29.84	60	N N W	30.06	44	"
25	30.22	46	Calm	30.25	64	S W	30.35	52½	Calm
26	30.49	51	N E	30.46	63	S E	30.44	54	S W
27	30.30	52	"	30.33	58	E S E	30.16	56	"
28	30.09	58	Calm	30.05	68½	N N W	30.03	57	"
29	29.90	57	N N E	29.84	68	S	29.83	57	Calm
30	29.85	57	Calm	29.82	69	N E	29.87	57	"
Oct. 1	29.96	56½	"	29.96	74	W S W	30.01	55	"
2	30.—	53	"	29.93	70	S W	29.83	58	S W
3	29.68	59	S S W	29.71	58½	N	29.84	45	N W
4	29.96	44	N N E	29.94	58	W	29.85	50	S W
5	29.74	52	Calm	29.74	64	N	29.83	46	Calm
6	29.74	52	"	29.45	67	S	29.53	57	S
7	29.69	49	N N W	29 88	52	N W	30.05	35	S W
8	30.04	38	N W	29.90	50	N N W	29.85	34	Calm
9	29.82	37	N N E	29.80	53	W S W	29.85	40	"
10	29.86	46	"	29.83	54	E N E	29 81	48	N E
11	29.52	50	N E	29.47	59	S S W	29.55	49	S W
12	29.76	46	S S W	29.77	52	S W	29.65	50	S S W
13	29.60	47	N N E	29.66	51	N W	29.77	39	N W
14	29.78	36	S W	29.76	41	S E	29.78	41	S W
15	29.80	42½	N E	29.60	45	N E	29.60	45	Calm
16	29.80	45	S W	29.87	52	N W	29.99	39	N W
17	30.05	35	"	30.13	51	N N W	30.26	37½	Calm
18	30.26	37	Calm	30.22	50	N	30.24	35½	"
19	30.25	37	"	30.18	42	E S E	30.03	39	E

1838.	8 A. M.			3 P. M.			10 P. M.		
	Barom.	Ex Thr	Winds.	Barom	Ex Thr	Winds.	Barom	Ex Thr	Winds.
Oct. 20	29.54½	47	N	29.59	56	N W	29.64	43	W
21	29.70	45	N W	29.72	50	Calm	29.78	43½	Calm
22	29.72	42½	Calm	26.86	49	N	29.99	40	N W
23	30.13	45	"	30.11	52	Calm	30.10	40	S W
24	29.95	41	"	29.77	47	S E	29.58	42	N E
25	29.57	41	W S W	29.54	46	S W	29.57	48	Calm
26	29.73	38	S W	29.77	54	W N W	29.90	40	"
27	29.95	35	Calm	29.71	44	S E	29.80	39	"
28	29.81	38	South	29.75	45	"	29.63	40	"
29	29.44	39	N N W	29.58	42	N W	29.77	29	"
30	29.80	40	N W	29.97	40	"	29.90	32	"
31	29.89	31	N E	29.91	32	N E	30.05	29	N N W

TABLE IX.

RAIN TABLE. By R. H. Gardiner, Esq., of Gardiner.

1838.	in. 12th 144th
June 2	0. 3. 6¼
3	0. 1. 4
5	0. 3. 8¾
6	0. 7. 8
7	0. 6. 0
8	0. 0.10
11	0. 0. 1½
13	0. 0. 2
14	0. 0. 2
16	0. 6. 5¼
17	0. 0. 2½
18	0. 6. 0¼
23	0. 0. 1½
25	0.11. 8
26	0. 0. 4
29	0. 7. 3
	in.
	4. 7. 5=4.6108 in.
July 2	0. 0. 1¾
3	0. 0. 3
4	0. 0. 7
5	0. 2. 1
12	0. 0. 7½
13	0. 1. 8¾
16	0. 0. 1
21	0. 7. 9½
25	0. 2. 0
26	0. 7. 1
	1.10. 4½=1.8646
Aug. 6	0. 2. 0
8	0. 0. 8
10	0. 4. 2
12	0. 0.11½
17	1. 0. 6

1838.	in. 12th 144th
Aug. 25	0. 1. 9
26	0. 0. 0½
28	0. 0. 4¾
29	0. 0. 0¾
31	0. 1. 9
	2. 0. 3½=2.024 in.
Sept. 1	0. 3. 4
2	0. 0. 0¼
13	1. 0. 3
14	1. 9. 7
19	0. 0. 7
22	0. 4. 0
24	0. 4. 8¼
27	0. 3. 6
28	0. 1. 5½
	4. 3. 5=4.285 in.
Oct. 4	0. 1. 3
7	0. 2.10
11	0. 4. 3½
12	0. 1. 8¾
13	0. 4. 1½
15	0. 1. 3
16	0.10. 0¾
20	0. 8. 1
22	0. 0. 8¾
24	0. 7. 0¼
26	0. 0. 5½
28	0. 1. 8
29	0. 2. 2
31	0. 2. 0 snow = to 0.2.0 rain.
	3.11. 8=3.972 in.

The two following wood cuts were not finished by the engraver in season to be inserted where they ought to have been printed in the body of the Report. They are therefore here presented, with reference to the descriptions of the localities.

View of Saddleback Mountain from French's Hill, Phillips.

This mountain is evidently more lofty than Mt. Abraham, and forms a long ridge with a hollow or saddle shaped outline, from which it evidently derives its descriptive name.

From Umbagog Lake there may be seen numerous high mountains, which are described in the Report upon the Androscoggin and Megalloway station (which see.)

Speckled Mountain is a lofty broken cone apparently of granite, rising high above the neighboring hills, and is said to be situated in a township called Holmes. It is probably more elevated than Mt. Abraham, and ranks as one of the highest mountains in the State.

Speckled Mountain seen from Umbagog Lake.

The following prices current of Slates in Wales, was handed to me by Captain ISAAC GAGE, and may be useful to those who engage in working the Slate Quarries of Maine.

Prices and particulars of Slates, at Port Penrhyn, Bangor, North Wales.

IMPERIALS—20, 24, 27 and 30 inches long, and various breadths,	50*s* per Ton.	of 20 cwt. and 112lb. per cwt.
QUEEN'S—27, 30, 33 and 36 inches long, and various breadths, if assorted *without specifying quantities of each*,	41*s* "	
35 DITTO—30 and 33 inches, *if both or either sizes be particularly ordered*,	43*s* "	
PRINCESSES—24 inches, by various breadths,	41*s* "	
TON SLATES or RAGS—irregular lengths and breadths,	31*s* 6*d* "	

DUCHESSES,	24 in. by	12 in.	weighing per *m.*	66	cwt.	of 112 lb.	140*s*	per Thousand.	of 1200 Slates.
DITTO, (small)	22 "	11	" "	50	"	"	105*s*	"	
COUNTESSES,	20 "	10	" "	44	"	"	95*s*	"	
VISCOUNTESSES,	18 "	9	" "	32	"	"	60*s*	"	
LADIES, (large)	16 "	10	" "	32	"	"	45*s*	"	
DITTO,	16 "	8	" "	27	"	"	40*s*	"	
DITTO, (small)	14 "	8	" "	22	"	"	25*s*	"	
DOUBLES,	13 "	6½	" "	17	"	"	17*s* 6*d*	"	
SINGLES,	11 "	5½	" "	13	"	"	9*s*	"	

INFERIORS.

DUCHESSES,	24 in. by	12 in.	weighing per *m.*	86	cwt.	of 112 lb.	110*s*	"
COUNTESSES,	20 "	10	" "	55	"	"	70*s*	"
LADIES,	16 "	8	" "	35	"	"	27*s* 6*d*	"
DOUBLES,	13 "	6½	" "	21	"	"	13*s*	"
MOSS SLATES,	11 to 15 in. by 6 to 15 in.						15*s*	"

	of 20 cwt., and 112 lb. per cwt.
Ton Slates,	none
Slabs sawn of promiscuous lengths and breadths in Lots as under :—	
Lot 1.—½ in. ¾ in. 1 in., and 1¼ in. thick, and in lengths, from 3 ft. to 6 ft. *Lot* 2.—¾ in. 1 in., 1½ in., 2 in. and 2½ in. thick, do. from 4 ft. to 8 ft. and upwards,	57*s* per Ton.
Ended Slabs sawn of promiscuous lengths and breadths in Lots as under :—	
Lot 1.—¾ in., 1 in., and 1¼ in. thick, and in lengths from 3 ft. to 6 ft. *Lot* 2.—1½ in, 2 in., and 2½ in. " " from 4 ft. to 8 ft. and upwards,	52*s* "
N. B. In ordering any of the above Slabs, it will only be necessay to mention which Lot, and the weight and thickness required, *as any specified lengths* and *breadths* will be charged *as Slabs cut to order*.	
Slabs sawn to order, not under 2 ft. long, nor exceeding 8 ft. long and 3 ft. 6 in. wide,	63*s* "
Ended Slabs, ditto ditto	58*s* "
Slabs and Ended Slabs exceeding 3 ft. 6. in. wide, if specially ordered, charged 5*s* per ton extra.	
Slabs or Skirting under 12 ins. wide, and various lengths, not less than ½ in. thick,	57*s* "
Ditto ditto ditto of specified lengths,	63*s* "
Unsawn Slabs,	50*s* "

Shipping Expenses on Slates, 6*d* per Ton ; on Slabs, 1*s* per Ton ; Bills of Lading, 3*s* 6*d*.

N. B. As an allowance of one Cwt. over in every Ton, and 60 Slates over in every Thousand, is made at the time of delivery of the Slates here for shipment, to cover breakage, no abatement, or other allowance can be made for any deficiency of breakage, that may occur in the shipment of the Slates or otherwise.

Vessels are always loaded according to the date of their arrival here, and not according to the date of the order, and when there is a stem or detention for Slates, vessels must wait their regular turn in loading.

About 147 feet superficial of Inch Slab, is computed to weigh a Ton.

Owing to the limited and uncertain supply of inferior Duchesses, any order for them can only be executed to the extent the supply will admit of at the time of the vessels loading.

Orders received here for Chimney Pieces and Cisterns, at the following pr[illegible]

No. 1—Plain Jambs, Mantle, and turned blocking, with plain edge shelf,	10s each.	
2—Moulded Jambs, Mantle, turned blocking, with "	18s "	
3—Moulded Jambs, &c. with bead Mould,	21s "	
4—Grecian Fret Jambs and Mantle,	30s "	
5—Moulded Truss Jambs and Mantle,	30s "	
6—Pannelled Jambs and Mantle,	30s "	
Coves for Chimney Pieces,	2s 6d per set.	

	In. thick.	*1½ In. thick.*
Cisterns, with sides and ends, not less than 5 ft. and under 15 ft. cubic contents,	2s 6d per foot.	3s per foot.
" " " 15 " 20 "	2s 4d "	2s 8d "
" " " 20 " 25 "	2s 3d "	2s 6d "
" " " 25 ft. to 30 ft. and upwards,	2s 2d "	2s 5d "

Tomb Stones complete from £4 10s and upwards.
Slabs Faced or Smoothed at 3d per foot, superficial.
N. B.—In any order for Chimney Pieces it will be quite sufficient to send the numbers only, as above, without any other description.

Prices of Writing Slates.

Sizes.	*Framed.*	*Unframed.*	
5 by 3	2s per doz.	10d per doz.	30 dozen in a Box.
6 by 4	2s 3d "	11d "	24 "
7 by 5	2s 9d "	1s 2d "	20 "
[illegible] 6	3s 6d "	1s 8d "	20 "
	[illegible] 6d "	2s 3d "	15 "

Prices of Writing Slates.

Sizes.	*Framed.*	*Unframed.*	
12 by 8	5*s* 6*d* per doz.	2*s* 9*d* per doz.	12 dozen in a Box.
13 by 9	7*s* 6*d* "	3*s* 6*d* "	12 "
14 by 10	9*s* 6*d* "	4*s* 6*d* "	10 "
16 by 11	12*s* "	5*s* 6*d* "	8 "

Book or Log Slates.

Sizes.		
11 by 7	24*s* per dozen.	5 dozen in a Box.
12 by 8	28*s* "	
13 by 9	35*s* "	
14 by 10	44*s* "	
16 by 11	55*s* "	

Boxes Framed Slates, 4*s* each.
" Unframed " 2*s* "

Discount off the above prices of State, 35 per cent.

Ext.

CATALOGUE

OF

GEOLOGICAL SPECIMENS,

IN THE

STATE CABINET, MAINE,

Collected in the years 1836, 1837 *and* 1838.

By CHARLES T. JACKSON.

SPECIMENS COLLECTED IN THE YEAR 1836.

ROCKS UNSTRATIFIED AND OF IGNEOUS ORIGIN.

Greenstone Trap is a rock composed of hornblende, feldspar and oxide of iron. Its name is from its green color, and the word trap from a Sweedish word meaning step or stair, as this often resembles, when columnar, steps. It resembles lava in its origin and its effects upon other rocks.

1. Columnar Greenstone Trap, from a dyke intersecting sienite rocks; Jonesport.
2. Columnar greenstone trap ; Buck's Harbor, Machias.
3. Rhomboidal column of trap; Eastport.
4. Column of trap; Morton's Cove, Lubec.
5. Compact greenstone trap from a dyke ; Morton's Cove, Lubec.
6. Greenstone trap, from a dyke in granite, near the vein of magnetic iron ore; west side of Marshall's Island.
7. Greenstone trap; Raymond.
8. Greenstone trap, (variety); Raymond.
9. Greenstone trap; Buck's Harbor, Machias.

10. Greenstone trap, coated with epidote, (a green mineral)—Point of Maine, Machias.

11. Greenstone trap—a crystalline variety, with distinct crystals of hornblende; Cross Island, Machias.

12. Porphyritic greenstone trap; Lawrence's Creek, Lubec.

Obs. A rock is *porphyritic*, when it contains distinct crystals of feldspar.

13. Amygdaloidal or scoriaceous trap rock, taken from the point of contact of the sandstone and a trap dyke; Loring's Cove, Perry.

Obs. Trap is *amygdaloidal* when it contains cavities, caused, as in cinders, slags, lavas, &c. by the escape of steam or gas, while in a melted state. The cavities are afterwards often filled by the infiltration of other minerals, as in specimens 22, 23, 24, 25, &c.

14. Same as 13, only that it contains a mass of scoria, formed from the sandstone, which has thus been altered by the fiery state of the trap; Perry.

15. Amygdaloidal trap, from a dyke in red sandstone; Friendship's Folly Island, N. B.

Obs. A *dyke* signifies a wall or vein of rock, which intersects another rock. *Dykes* are formed during earthquakes, by the bursting open of the earth, forming cracks or fissures, which are immediately filled up with the melted lava or trap—the cause of the earthquake. Dykes of trap are common on the eastern coast, and at Thomaston, where they run in nearly straight lines, cutting through the quarries that lie in their course; and when large, materially altering the appearance of the limestone, which is in contact with them. (See specimens from 191 to 198.)

16. Amygdaloidal trap, connected with a mass of red sandstone. In this specimen, the sandstone has the appearance of having been burnt. It differs essentially from the sandstone found near it, (No. 325,) not in contact with the trap; Loring's Cove, Perry.

17. Vesicular trap; Perry.

Obs. *Vesicular* is nearly the same in meaning as amygdaloidal, viz. full of cavities.

18. A red amygdaloid of trap, in which the cavities have been filled with a green mineral called chlorite. (Nos. 467, 468, 469.)

19. Amygdaloidal trap, from point of contact with the brecciated limestones of Point of Maine, Machias. (Nos. 291 to 300.)

20. Scoriæ of trap and sandstone; Perry.

Obs. *Scoriæ* is synonymous with cinders. It is generally applied to volcanic cinders.

21. Greenstone trap, containing a vein of calcareous spar; above Loring's Cove, Perry.

Obs. *Calcareous spar* is carbonate of lime, or limestone crystalized.

22. Amygdaloidal trap, the cavities filled with calcareous spar, (See obs. to Nos. 13 and 21;) Gin Cove, Perry.

23. Same as 22 ; Gin Cove, Perry.

24. Amygdaloidal trap, cavities filled with calcareous spar and chlorite; Perry. (See Nos. 18 and 21.)

25. Same as 18.

26. Same as 22; Baileyville.

27. Amygdaloidal trap, containing prehnite, a simple mineral of a green color ; above Loring's Cove, Perry.

28. Amygdaloid, formed by junction of trap with sienite; Jonesport.

29. Scoriæ of trap and sandstone, (see 20); above Loring's Cove, Perry.

30. Same as 29.

31. Breccia of trap and porphyry; Hog Island, Lubec.

Obs. *Breccia* is a name given to rocks that have been violently broken up, and the fragments cemented together by another rock, which was in a melted state. It differs from sandstones, being formed of *angular* fragments, while sandstones are of pebbles, rounded off by the action of water.

32. Same as 31.

33. Same as 31; Eastport.

34. Breccia of trap and red feldspar rock; Buck's Harbor, Machias.

35. Finer variety of the same.

36. Breccia of trap and sienite; Jonesport.

Obs. *Sienite*—a rock like granite, from which it differs in having hornblende instead of mica. In this, and the three following specimens, the sienite has been broken up and cemented by the trap.

37. Same as 36.

38. Same.

39. Same.

40. Breccia of trap and slate; Seward's Neck, Lubec.

41. Breccia of trap and limestone; South side Rogers' Island, Lubec.

42. Breccia of trap and limestone; Morton's Cove, Lubec.

43. Column of porphyry; Seward's Neck, Lubec.

44. Same.

45. Columnar porphyry; Seward's Neck.

46. Same; Gove's Point, Seward's Neck.

47. Vescicular porphyry; Seward's Neck. (See No. 17, Catalogue.)

48. Porphyry; East side of Little Kennebec Bay, Machias.

49. Porphyry, containing crytals of iron pyrites (sulphuret of iron, see Nos. 25, 26, 27,) in cubic form—found beneath the trap; Eastport.

50. Same.

51. Porphyry, with crystals of iron pyrites, in the form of pentagonal dodecædron; Eastport.

52. Porphyry—from junction with trap dyke; Seward's Neck, Lubec.

53. Porphyry, with iron pyrites; Davis', Raymond.

54. Same.

55. Clinkstone porphyry; Dennysville river.

Obs. Called *Clinkstone* because it gives a metalic sound when struck with a hammar.

56. Red feldspar rock; Buck's Harbor, Machias.

57. Same.

58. Same.

59. Red feldspar rock; Neutral Island, St. Croix River.

Obs. *Red feldspar rock* is little different from porphyry.

60. Compact feldspar rock; N. E. Harbor, Mt. Desert.

61. Jasper; Little River, Eastern Head, Cutler.

Obs. This mineral is produced at the contact of trap and slate rocks.

62. Jasper breccia; Starbord's Creek, Machias.

63. Same.

64. Fine compact breccia; Starbord's Creek.

65. Same.

66. Same, with flinty slate.

67. Same, with coating of epidote.

68. Ribbon jasper; Jasper Head, near Buck's Harbor, Machias.

Obs. This rock was evidently once a stratified rock—but since its formation it has been semifused, and the stripes are the remains of the lines of stratification.

69. Same.

70. Same.

71. Brecciated ribbon jasper; same locality.

Obs. In this specimen, the stripes have been violently broken up by protrusion of a trap dyke.

72. Same.

73. Same.

74. Red sienite; Jonesport. (See Catalogue No. 36, obs.)

75. White sienite, from a vein cut off by a trap dyke; Jonesport.

76. Sienite; Mt. Desert.

77. Red sienite; Neutral Island, St. Croix river.

78. Same.

79. Same.

80. Red sienite; Robbinston.

81. Sienite; Davis', Raymond.

82. Granite; Raymond.

83. Granite; Lincoln.

84. Granite; Benj. Brown's, Vassalborough.

85. Granite; Harrington.

86. Granite; McHerd's Quarry, Bluehill. (See specimens 538, 539.)

87. Granite; on the road between Calais and Houlton.

88. Porphyritic granite; St. Stephens, N. B. (See Catalogue, No. 12, obs.)

89. Granite; Whidden's Quarry, Calais. The feldspar red, the mica black.

90. Same.

91. Granite, with red felspar and black mica; Black's Island, Mt. Desert.

92. Same.

93. Granite, dark color, with white veins near its junction with trap; Burnt-coat Island.

94. Granite, including a piece of stratified rock changed into mica slate; N. E. Harbor, Mt. Desert.

95. Hornblende rock; Calais.

96. Hornblende rock; Cape Split, Addison

PRIMARY STRATIFIED ROCKS.

Originally deposited from water; some of which have since become crystalline by the action of heat.

97. Gneiss—a kind of granite, from which it differs in the materials lying in regular strata or layers; Hallowell.

98. Gneiss; Megunticook Mt., Camden.

99. Mica slate; Megunticook Mt., Camden. (For varieties, see Nos. 584, &c.)

100. Mica slate, containing staurotide and garnets; Searsmont.

101. Mica slate, containing graphite and staurotide; Mr. Potter, Sebago.

102. Mica slate, containing staurotide; near the base of Saddle-back Mountain.

103. Mica slate, containing staurotide and garnets; Jackson, Mr. Brown.

104. Mica slate; North Yarmouth. Contains garnets.

105. Mica slate; Corinth.

106. Mica slate, containing macle; found on the beach at Camden—loose. (See No. 449.)

107. Same.

108. Talcose slate; taken from the walls of a limestone quarry at Thomaston.

109. Talcose slate; Lime Islands, Penobscot Bay.

110. Talcose slate, altered by trap—contains epidote; Lime Islands, Penobscot Bay.

111. Plumbaginous slate; Brigadier's Island.

Obs. *Plumbaginous* is when a rock contains plumbago or graphite, commonly, but incorrectly, called black lead.

112. Plumbaginous slate; Patricktown Plantation, Eph. Rice.

113. Plumbaginous slate; Searsmont.

114. Graphite or Plumbago; Searsmont.

115. Plumbaginous slate; Belfast—Judge Read's farm.

TRANSITION SERIES.

116. Argillaceous slate; Haycock's Harbor, Trescott.

Obs. The common roofing and writing slates are *argillaceous*. (See Nos. 123, 124, 626, 627, &c.)

117. Same as 116.

118. Argillaceous slate; West Quoddy Head, Lubec.

119. Argillaceous slate; Lubec.

120. Argillaceous slate; Samuel Ward, Penobscot.

121. Same.

122. Argillaceous passing to mica slate; contains iron pyrites; East Thomaston.

123. Common writing slate; from slate quarry at Foxcroft, Penobscot County—Benj. Leavitt.

124. Same.

125. Pyritiferous slate; Vinalhaven, Hancock—J. A. Amesbury.

Obs. *Pyritiferous*—containing iron pyrites, yellow crystals composed of sulphur and iron. When slate contains this sulphuret of iron, it is used for making alum and copperas, specimens of which may be seen (Nos. 843, 844) made from the pyritiferous slates of Jewel's Island, Casco Bay. (Nos. 127, 610, 611.)

126. Same.

127. Pyritiferous slate; Jewel's Island, Casco Bay. (See obs. to No. 125.)

128. Pyritiferous slate; West Quoddy Head, Lubec.

129. Pyritiferous slate; Haycock's Harbor, Trescott.

130. Ferruginous slate; West Quoddy Head, Lubec.

OBS. *Ferruginous*—containing iron.

131. Flinty slate; Haycock's Harbor, Trescott.

132. Same, in contact with trap.

133. Breccia of slate; Munroe's Island. (See No. 31, obs.)

134. Blue slaty limestone, with fossil shells; Broad Cove, Moose Island.

135. Chert—from junction of calciferous slate and trap rock; Trescott.

OBS. This mineral is often produced by the action of trap rocks upon slate containing lime, or *calciferous* slate.

136. Greywacke, with calciferous slate; Leighton's farm, Pembroke.

OBS. *Greywacke* is a rock composed of various pebbles, united by an argillaceous or clayey cement. It frequently includes valuable beds of anthracite coal.

137. Same.

138. Calciferous slate; East side of East Bay, Perry.

139. Same.

140. Same.

141. Calciferous slate; Lawrence's Creek, Lubec.

142. Same.

143. Compact limestone; Comstock's, Lubec.

144. Compact blue limestone; Morton's farm, Lubec.

145. Same.

146. Same—strata contorted.

147. Argillo-ferruginous limestone; near the Lead Mines, Lubec. Contains impressions of terebratulæ, a fossil shell.

148. Same.

149. Reticulated limestone; Morton's farm, Lubec.

OBS. *Reticulated*—like net work, which this specimen resembles in its veins of calcareous spar. (See obs. No. 21.) A polished specimen.

150. Same—not polished.

151. White granular limestone; Thomaston.

152. Same; Meadow Quarries, Thomaston.

153. Same.

154. Same, of a darker color and clouded.

155. Same—polished, making a fine clouded marble.

156. Clouded limestone, or marble; State Prison Quarry, West Thomaston.

157. Blue limestone; Blackington's corner, East Thomaston.

158. Same.

159. Same.

160. Blue limestone; Hope.

161. Compact limestone; Hope.

Obs. It is from this rock the lime sold under the name of "Lafayette Lime," is made.

162. A specimen of the same—polished.

163. A delicate marble, made from the same.

164. Dark colored marble with white veins, polished; Hope.

165. Blue limestone, with white veins; taken from near a trap dyke, western part of Hope.

166. White granular limestone; Lilly Pond Quarry, Camden.

167. Same—blue and white.

168. Blue and white specimen of the same—polished.

169. Blue granular limestone; North from Lilly Pond Quarry, Camden. Contains crystals of tremolite.

170. White granular limestone; Lincolnville.

171. Limestone; Brooks, by Dr. Roberts'.

172. Compact limestone; St. John, New Brunswick.

173. Blue marble; Thomaston—polished.

174. Clouded marble; Thomaston—polished.

175. Same—polished.

176. Black marble, containing iron pyrites; Thomaston—polished.

Obs. The pyrites are an injury to the limestone, because if exposed to dampness, they are liable to decompose and stain the stone with an iron rust.

177. Grey marble—State Prison Quarry—polished; West Thomaston.

178. Clouded marble; Hallowell—polished.

Dolomites, or Magnesian Limestones.

179. Granular Dolomite; Hope.

180. Same.

181. Brecciated Dolomite; Carlton's Quarry, Camden. (See obs. No. 31.)

182. Same.

183. Granular Dolomite; Dr. Cochran's Marsh Quarry, East Thomaston.

184. Same—polished. (Statuary marble.)

185. Dolomite; St. George's River, Thomaston.

Specimens shewing the action of Trap Rocks upon the Limestones.

186. Greenstone trap; from a dyke in Crockett's Quarry, East Thomaston.

187. Same.

188. Limestone, connected with trap dyke; Beech-wood Quarry, Thomaston.

Obs. The dyke of trap, from which this was taken, was too narrow that the limestone in contact with it should be materially altered, as it is in Nos. 194, 195, 196. Its whole width is seen in the specimen. For explanation of *Dyke* and its effects, see obs. No. 15. (See obs. 191.)

189. Same.

190. Same as 188 and 189.

191. Limestone, intersected by trap dyke and become white and chystalline at point of contact.

Obs. The limestone is found to be more altered, and at greater distances from the trap dyke, in proportion as that increases in width. In this specimen it has been sufficiently wide to cause heat enough to melt and render crystalline the limestone in immediate contact with it. Sir James Hall has found by experiment that limestone can be subjected to the most intense heat, without burning it to lime. It is only necessary to confine it under great pressure, so that the carbonic acid gas and water cannot escape; and the stone is melted, altering it precisely as the limestone is altered in this and the few succeeding specimens. In specimens 188, 189, 190, the dyke was too small to cause sufficient heat to alter the stone.

192. Limestone, rendered white and crystalline by trap—(See obs. 191;) Whitefield.

193. Same; from Pierce's Quarry, Hope.

194. Same; from Snow's Quarry, Thomaston.

195. Same; from Crockett's Quarry, Thomaston.

196. Limestone, in contact with talcose slate; Hope.

197. Same.

198. Same.

199. Limestone and trap—refuse rock; State Prison Quarry, West Thomaston.

200. Limestone, altered by trap—refuse rock; Snow's Quarry, Thomaston.

201. Limestone, altered by trap; Morton's Cove, Lubec.

202. Trap and limestone intermixed, the latter being rendered crystalline; Morton's Cove, Lubec.

203. Limestone trap, mica, and actynolite; State Prison Quarry, West Thomaston.

204. Limestone containing graphite, (a simple mineral, called also plumbago and black lead;) Goose River Quarry, Camden.

205. Limestone containing Tremolite; Beech-wood Quarry, Thomaston.

206. Same.

207. Limestone containing sulphuret of iron; Beech-wood Quarry.

208. Same.

209. Calcareous spar, (crytalized carbonate of lime;) Achorn's Quarry, East Thomaston.

210. Calcareous spar, in six sided prisms. Crystals large and perfect; Beech-wood Quarry, Thomaston.

211. Calcareous spar, in low six sided crystals, striped with white; taken from near trap dyke, Achorn's Quarry, East Thomaston.

212. Same—bronzed with sulphuret of iron.

213. A single crystal of the calcareous spar of No. 210.

214. Calcareous spar and trap—a mass in amygdaloidal trap; Broad Cove, Eastport.

215. Foliated calcareous spar; Lubec.

Slates connected with the Limestones.

216. Talcose slate; walls of Marsh Quarry, East Thomaston.

217. Rhomboidal plate of talcose slate; walls of Marsh Quarry, East Thomaston.

218. Grey compact limestone and compact talc; Marsh Quarry, Thomaston.

219. Quartz rock and talcose slate, forming the western wall of the Marsh Quarry.

220. Mica Slate; half a mile north of Marsh Quarry.

221. Quartz rock; Marsh Quarry, East Thomaston.

222. Talcose slate; north from Lily Pond Quarry, Camden.

Fossil Shells of Transition Series.

223. *Trilobite*—asaphus—in slate; Clark's farm, Pembroke. [Plate 1, fig. 1.]

OBS. The trilobites are an extinct race of animals, somewhat resembling the "Horse-shoe" or King Crab.

224. Same as 223.

225. *Trilobite*, calymene; Pembroke.

OBS. This species of the trilobite had the power of rolling himself up into a round ball as in this specimen.

226. The external cast of the same.

227. Tribolite and terebratulæ; Pembroke.

OBS. The terebratula is common as a fossil shell; but rarely found living. There is one specimen of a recent species among the shells in the Cabinet.

228. Trilobite, terebratulæ, &c. in fossiliferous limestone; from a boulder found on the St. John River, N. B.

229. A piece of the same boulder, containing terebratulæ and encrinites.

230. *Lutraria*, in calciferous slate; Clark's farm, Pembroke.

231. Same.

232. Terebratulæ; Pembroke. [Plate 1, fig. 9.]

233. Terebratulæ in argillo-ferruginous limestone; near the Lead Mines, Lubec.

234. Terebratula; Lubec. [Plate 1, fig. 10.]

235. Terebratula; Trescott's farm, Lubec.
236. Terebratula; Pembroke.
237. Terebratulæ in greywacke, (loose;) Troy.
238. Terebratulæ and producti; Pembroke.
239. Same
240. Productus; Pembroke.
241. Producti; Pembroke.
242. Producti and spiriferæ; Pembroke.
243. Same.
244. Turritella; Clark's farm, Pembroke. [Plate 3, Fig. 5.]
245. Turritellæ, in argillo-ferruginous limestone; Pembroke.
246. Turritellæ and terebratulæ; Pembroke.
247. Same.
248. Saxicava; Pembroke.
249. Saxicavæ; Pembroke.
250. Same.
251. Mytili or lingulæ; Lawrence's Creek, Lubec.
252. Mytili or lingulæ; Lawrence's Creek, Lubec.
253. Mytilus; Pembroke. [Plate 1, fig. 12.]
254. Mytilus; Pembroke.
255. Anomiæ; opposite Rogers' Island, Lubec.
256. Same.
257. Same.
258. Same.
259. Unknown. [Plate 3, fig. 9.]
260. Unknown. [Plate 3, fig. 12.]
261. Unknown. [Plate 3, fig. 5.]
262. Unknown. [Plate 2, fig. 5.]
263. Aviculæ? Clark's farm, Pembroke.
264. Same.
265. Same.
266. Unknown. [Plate 2, fig. 1.]
267. Tellinæ?
268. Unknown.
269. Unknown.
270. Nautilites?

271. Avicula; Pembroke.

272. Encrinite, &c.; Pembroke.

273. Orthoceratite; Pembroke.

274. Hippurite and Terebratulæ, from boulder; River St. John, New Brunswick.

275. Fuci, in calciferous slate; Hersey's Head, Pembroke.

Obs. *Fuci* are the remains of sea plants, such as common sea weed, &c.

276. Fuci and fossil shells, in calciferous slate; Denbo's Neck, Lubec.

277. *Gorgonia*—Jacksoni; Pembroke.

Obs. *Gorgonia* is a species of the sea-fan.

SECONDARY SERIES.

278. Limestone, containing fossil shells, (Natica socialis;) Starbord's Creek, Machias. A large polished slab. The shell may be seen more distinctly in specimen 343.

279. Limestone, formed of fossil shells; Starbord's Creek, Machias.

280. Same.

281. A specimen of the same, in which the shells are rendered more distinct by action of the weather.

282. Same.

283. New red sandstone, and limestone composed of shells; Starbord's Creek.

284. Same.

285. Sandstone and limestone—half melted together by the action of trap; Starbord's Creek.

286. New red marl or sandstone, indurated by trap; Starbord's Creek.

287. Limestone, suitable for making hydraulic cement; Starbord's Creek.

288. Calciferous slate; Starbord's Creek. This passes into the hydraulic cement stone.

289. Same.

290. Brecciated marble, composed of fragments of limestone, sandstone, &c.; Point of Maine, Machias.

291. Same.

292. Same.

293. Same—polished.

294. New red marl or sandstone, hardened by trap; Point of Maine.

295. Same.

296. Limestone which has been formed by fusion of the shell marble, like that from Starbord's Creek, [278, 279.] It contains some indistinct traces of shells, but the limestone is crystalline. Found a large mass in trap dyke; Point of Maine, Machias.

297. Same.

298. A specimen in which the shells are more distinct.

299. A specimen of the same, connected with the trap, by which it is altered.

300. Limestone and trap interfused; Point of Maine.

301. Spotted limestone, suitable for marble; L'Etang, N. B.

302. Clouded marble; L'Etang, N. B.

303. Same.

304. Compact blue and grey limestone; L'Etang.

305. Same.

306. Cellular limestone; L'Etang.

307. Greenstone trap; from a dyke in the limestone, at L'Etang, New Brunswick.

308. Limestone and talcose slate, containing iron pyrites (crystals of sulphuret of iron;) L'Etang, N. B.

309. Talcose slate, containing pyrites—found in connexion with the secondary limestone; L'Etang.

310. Calcareous spar, in rhomboidal form; L'Etang.

311. Same.

312. New red sandstone or red marl, indurated by trap; Great Island.

313. Indurated marl; Great Island.

314. Same—containing fossil shells; shells indistinct.

315. Indurated red marl, containing fossil shells; Great Island.

316. Same.

317. Same.

318. New red sandstone (freestone;) Nutter's Head, Pembroke.

OBS. This rock, under the name of freestone, is well known in architecture. It is used in building, and for jambs for fire-places.

319. Same.

320. Compact sandstone, suitable kind for whetstones; Nutter's Head, Pembroke.

321. Sandstone, altered by trap, being hardened by the heat and cracked; Nutter's Head, Pembroke.

322. Large sheet of sandstone.

323. Red sandstone—fine grained; Perry.

324. Same; Lewis' Cove, Perry.

325. Variegated red sandstone; near Pulpit Rock, Perry.

OBS. The green spots are caused by silicate of iron.

326. Same.

327. Coarser variety of red sandstone; Perry.

328. Same.

329. Very coarse sandstone; Liberty Point, Robbinston.

330. New red sandstone; Tobique River, N. B.

331. Grey sandstone; Perry, near Pulpit Rock.

332. Grey sandstone; Joe's Point, St. Andrews.

333. Coarse conglomerate or sandstone; Joe's Point, St. Andrews, N. B.

334. Same.

335. Red sandstone, altered by trap, (See 15 and 16;) Friendship's Folly Island, N. B.

336. Same.

337. Sandstone, with veins of calcareous spar; Perry, Loring's Cove. (See obs. 21.)

338. Alabaster or gypsum (sulphate of lime;) Dorchester, New-Brunswick.

Obs. These specimens (338 and 339) were obtained at the Plaster Mills, Lubec. The stone is carried there in large quantities from New Brunswick, and ground up and calcined, to make plaster and the nicer kind of stucco. It is also useful for working into vases and other ornaments, and the poorer kinds are much used, under the name of "Plaster," as a manure.

9. Alabaster, (see 338); Dorchester, N. B.

0. Bituminous coal; from the Coal Mines above St. John, Grand Lake, N. B.

Fossils of the Secondary Series.

1. Fuci (see obs. 275) in new red sandstone; above Pulpit Rock, Perry.

2. Same.

3. Natica (socialis?) from the Starbord's Creek limestone, Machais. [Plate 3, fig. 20.]

4. Limestone, containing the Natica (socialis ?) Starboard's Creek, Machias.

5. Mytili or lingulæ; from the limestone of Starbord's Creek, Machias.

6. Remains of fossil shells; Point of Maine, Machias.

7. Same—shells unknown.

8. Bivalve shell, resembling the Venus; Starbord's Creek, Machias.

9. Mytilus; Point of Maine.

0. Tellina? Point of Maine.

TERTIARY SERIES.

1. Plastic clay; Madawaska.

2. Same, containing blue phosphate of iron—a substance used for making a blue paint.

3. Blue phosphate of iron; found in the clay of Madawaska.

Obs. This substance is found filling the inside of hollow sticks, preserved in clay. Sometimes the sticks have entirely decomposed, leaving only the phosphate of iron. It is used for making a blue paint.

354. Clay; Lubec—found under a peat bog on the "Carrying Place."

355. Same.

356. Peat; Lubec—Carrying Place.

357. Same. (See 360, obs.)

358. Peat; Lubec—Carrying Place.

359. Compact peat; Thomaston.

360. Same.

Obs. Peat is a substance which, in other States, is valued as fuel, and a manure. In Massachusetts, it is worth about five dollars a cord. Mixed with a little animal manure, it answers well for all soils; but with lime alone, it is injurious.

361. Bog iron ore; Greenwood.

362. Bog iron ore; Dover.

363. Bog iron ore; Black's Island.

364. Same.

365. Bog iron ore; Strong.

366. Bog iron ore; Strong.

367. Bog iron ore; Clinton.

368. Bog iron ore; Kennebec River.

369. Bog manganese; Thomaston.

370. Bog manganese; Bluehill.

Fossils of the Tertiary Series.

371. Pectens-Poelii; taken from a clay bank, twenty-six feet above the level of the highest tides, near the Plaster Mills, Lubec.

372. Saxicavæ-distortæ; same locality.

373. Same.

374. Patellæ; same locality.

375. Fragments of Balani, &c.; same locality.

376. Concretion, inclosing mya-mercenaria; North Yarmouth.

Obs. *Concretions* are formed by clay adhering around any substance, which acts as a nucleus, until that substance is concealed by the clay. (See No. 378.)

377. Concretion, enclosing natica-heros; North Yarmouth.

378. Concretions enclosing nucula portlandica; banks of Cousin River, North Yarmouth.

Obs. In these specimens the shell is entirely concealed, but may be found on breaking open the concretion.

379. Nucula-portlandica—a shell found only in the clay in this State. No such animal has ever been seen living; Presumpscot Falls, Portland.

380. Nucula; found in the clay, Presumpscot Falls.

381. Nucula—new species; Presumpscot Falls.

382. Saxicavæ and Mactræ; Presumpscot Falls.

383. Specimens of siphoniæ—a fossil animal; found in the clay at Bangor. Little is known concerning them.

Simple Minerals.

384. Crystals of quartz; Castine Harbor.

385. Crystals of quartz, colored by iron.

386. Quartz crystals, calcareous spar, analcime, and apophyllite, from the lining of a basin-shaped cavity, or geode of agate in amygdaloidal trap; Gin Cove, Perry.

387. Quartz crystals, from same geode; Perry.

388. Agate of amethystine quartz, carnelian and chalcedony; Perry.

389. Quartz, calcareous spar, and green chalcedony; Perry.

390. Granular quartz; Liberty—B. C. Matthews.

Obs. This stone is well suited for the manufacture of glass, it being a very pure kind of quartz, and easily reduced to powder by heating and plunging in cold water.

391. Granular quartz; Liberty. (See 390.)

392. Granular quartz; Whitefield.

393. Hornstone in greenstone trap; Trescott.

394. Jasper; Little River, Cutler.

395. Quartz and feldspar; Jonesport.

396. Calcareous spar in hexagonal prisms, surmounted by three sided pyramid; Thomaston. (See 21, obs.)

397. Single crystals of the same.

398. Calcareous spar, in low hexagonal prisms; Tolman's Quarry, Thomaston.

399. Same, in decomposing trap rock.

400. Same, in lenticular crystals; Achorn's Quarry, Thomaston.

401. Rhomboidal crystal of calcareous spar; Cross Island.

402. Same.

403. Rhomboidal calcareous spar.

404. Calcareous spar, containing sulphurets of lead and copper; Kelley's Cove, Trescott.

405. Same.

406. Calcareous spar and trap; from the Lubec Lead Mines.

407. Blue limestone, with veins of calcareous spar; Ramsdell's farm, Lead Mines, Lubec.

408. Blue limestone, with remains of terebratulæ; Lubec Lead Mines.

409. Same.

410. Tremolite; Thomaston.

411. Same.

412. Crystals of hornblende; Thomaston.

413. Laumonite in Nodule of limestone; Point of Maine, Machias.

414. Sphene; Thomaston.

415. Epidote and quartz in trap; Lubec.

416. Garnet and hornblende; Freeport.

417. Green fluor spar, in octahedral crystals; Bluehill.

Obs. This substance is used in chemistry in the manufacture of fluoric acid, and for some other purposes. (See Nos. 812, &c.)

418. Arsenical iron; Bluehill.

419. Arsenical iron; Fairfield.

420. Arsenical iron; Bluehill.

421. Arsenical iron; Owl's Head, Thomaston.

Obs. These crystals of arsenical iron contain about fifty-four per cent. of arsenic—the remainder iron.

422. Arsenical pyrites and arsenical iron; Owl's Head.

Obs. The former is a combination of sulphur, arsenic and iron—the latter of arsenic and iron.

423. Same.

424. Same.

425. Iron pyrites in red porphyry; Eastport.

426. Iron pyrites, or sulphuret of iron; Eastport.

427. Iron pyrites in feldspar; Raymond.

428. Iron pyrites in slate; Industry—Mr. Davis.

429. Pyrites and galena, or sulphuret of lead; East Thomaston.

430. Iron pyrites bronzing slate; West Quoddy Head, Lubec.

431. Sulphate of iron, resulting from the decomposition of sulphuret of iron in slate; Jackson.

432. Sulphuret of molybdenum—useful for manufacturing molybdic acid; Bluehill.

433. Galena, or sulphuret of lead—first drift; Lubec Lead Mines. Contains eighty-three per centum of lead.

434. Same.

435. Same.

436. Galena and copper pyrites, or sulphuret of copper—second drift; Lubec Lead Mines.

437. Blende, or sulphuret of zinc—first drift; Lubec Lead Mines.

438. Black Blende—third drift.

439. Black blende with phosphate of lead—second drift; Lubec Lead Mines.

440. Galena and blende—first drift.

441. Same.

442. Galena, blende and copper pyrites—third drift.

443. Galena, blende, copper pyrites and trap.

444. Same—first drift.

445. Sulphurets of lead and zinc; West Quoddy Head, Lubec.

446. Same.

447. Andalusite; Searsmont.

448. Same.

449. Macle, crystals of andalusite in mica slate; Camden.

450. Magnetic iron ore—a specimen possessing strong polarity—contains seventy-two per cent. of iron; Marshall's Island, off Mt. Desert.

451. Same.

452. Same.

453. Same.

454. Magnetic iron ore in compact feldspar; **Marshall's Island.**

455. Magnetic iron ore; **Patricktown.**

456. Magnetic iron ore; John Davis—**Raymond.**

457. Magnetic iron ore; **Mt. Desert.**

458. Same.

459. Veins of magnetic ore in sienite; **northeast Harbor, Mt. Desert.**

460. Brown pyrites, (sulphuret of iron,) **Mt. Desert.**

461. Specular iron ore; West side of **Seward's Neck, Lubec.**

462. Same.

463. Same, with quartz.

464. Magnetic iron ore, containing remains of terebratulæ; **Nictaure, N. S.**

Obs. Fossil remains were never before found in magnetic iron ore. Circumstances lead to the conclusion that the shells were imbedded in a comparatively recent deposit of hydrate of iron, or bog iron ore, and the whole was afterwards subjected to intense heat from the trap, and changed into magnetic iron ore. This ore was formerly worked at Pembroke, Me., where these specimens were obtained.

465. Same.

466. Oxide of iron and manganese in slate; **East Thomaston.**

467. Prehnite and calcareous spar, in amygdaloidal trap; **above Loring's Cove, Perry.**

468. Chlorite; Cross Island.

Obs. This mineral is soft and tough—is wrought into inkstands, vases, &c. It is also used for making a green dye. The Indians carve it into tobacco pipes. It takes a good polish. (See 470.)

469. Same.

470. Same—polished.

471. Same, with calcareous spar; **Cross Island.**

472. Chlorite in sienite; **Raymond.**

CATALOGUE

OF SPECIMENS

COLLECTED IN THE YEAR 1837.

ROCKS UNSTRATIFIED AND OF IGNEOUS ORIGIN.

473. Columnar Trap; Bond's Mt., Newfield. (See obs. before No. 1.)
474. Columnar trap; White-head, St. George.
475. Columnar trap; Jewel's Island, Casco Bay.
476. Greenstone trap, with carbonate of lime; U. S. Quarry, Kennebunk Port.
477. Greenstone trap; Thing's Mt., Newfield.
478. Greenstone trap, containing iron pyrites; U. S. Quarry, Kennebunk Port.
479. Greenstone trap; Jewel's Island.
480. Porphyritic trap; Kennebunk Port. (See obs. No. 12.)
481. Same.
482. Greenstone trap, vescicular; Kennebunk Port. (See obs. No. 17.)
483. Greenstone trap, containing calcareous spar; Owl's Head, Thomaston.
484. Greenstone trap; Western Island, Penobscot Bay.
485. Greenstone trap; Bald Head, York.
486. Same.
487. Porphyritic trap, with hornblende and iron pyrites; Cape Neddock, York.
488. Greenstone trap; Cape Neddock.
489. Greenstone trap, vescicular; White-head, St. George. (See obs. No. 17.)
490. Greenstone trap; Kennebunk Port.

Obs. This specimen shows the effects of heat in its cracked and broken surface.

491. Amygdaloidal trap and slate; Little Deer Island. (See obs. No. 13.)

492. Same.

493. Porphyritic trap and slate; Cape Neddock.

494. Hornblende rock, or greenstone trap, composed of crystals of hornblende; White-head, St. George.

495. Serpentine; Deer Island, Penobscot Bay.

OBS. This rock being susceptible of a high polish, (see 499, 500,) is much used in the manufacture of vases, boxes, chimney ornaments, and for a variety of other purposes.

496. Same.

497. Serpentine, containing carbonate of lime; Deer Isle.

498. Serpentine, containing veins of asbestus—(see No. 747;) Deer Isle.

499. Serpentine; Deer Isle—polished.

500. Serpentine, with veins of asbestus—polished.

501. Serpentine, with carbonate of lime—polished.

502. Mica and quartz rock; St. George.

503. Amygdaloidal quartz and mica; Herring Island, St. George. (See obs. No. 13.)

504. Junction of trap and granite; Owl's Head.

505. Junction of trap and sienite; Thing's Mt., Newfield.

506. Junction of trap and granite; U. S. Quarry, Kennebunk Port.

OBS. The three last specimens are designed to shew the effects of trap in melting and becoming united to other rocks.

507. Breccia of trap, slate, and limestone; Vinalhaven. (See obs. No. 31.)

508. Mica, quartz, and hornblende; Cape Neddock, York.

509. Sienite, (see obs. No. 36,) composed principally of green feldspar; Wells.

510. Same.

511. Compact sienite; York.

512. Coarse sienite; York.

513. Same—shewing the surface that was exposed to the action of the weather decomposed.

514. Sienite; Wayne.
515. Sienite; Cape Neddock.
516. Sienite; Agamenticus.
517. Porphyritic sienite; Wells.
518. Granite, composed principally of black mica; Bath.
519. Granite, composed chiefly of feldspar and black mica; Boothbay.
520. Granite with veins of quartz; Herring Island, St. George.
521. Granite; Thomas's Quarry, Eden.
522. Granite; Waterford.
523. Granite; Edgecomb.
524. Same.
525. Same—shewing hewn surface.
526. Granite; Whitehead, St. George.
527. Granite; St. George.
528. Granite; Hill farm, Biddeford—Mr. Emery.
529. Same.
530. Same.
531. Granite; Biddeford.
532. Granite; Emmons' Quarry, Biddeford.
533. Granite; Ocean Quarry, Kennebunk Port.
534. Granite; Kennebunk Port.
535. Granite; U. S. Quarry, Kennebunk Port.
536. Same.
537. Granite; Kennebunk Port.
538. Granite; McHerd's Quarry, Bluehill.
539. Same.
540. Granite; N. Y. Quarry, Bluehill.
541. Same.
542. Same, with hewn surface.
543. Granite; Darling's Quarry, Bluehill.
544. Granite; Pitch Pine Hill, Phipsburg.
545. Same.
546. Granite; Phipsburg Basin.
547. Granite; Buck's Harbor, Brooksville.

548. Granite; Musquito Mt., Frankfort.
549. Same—shewing hewn surface.
550. Same—half polished.
551. Granite; Frankfort—another quarry.
552. Same. This variety is of the kind called granite gneiss.
553. Same.
554. Granite—vein in gneiss; Frankfort.
555. Same.
556. Granite; Owl's Head, Thomaston.
557. Granite; Paris.
558. Granite; North Berwick.
559. Granite; Mt. Waldo.
560. Granite; Deer Isle, Penobscot Bay.
561. Granite; New Meadows, near Bath.
562. Granite.
563. Granite—hewn block; Hallowell.
564. Granite; Hallowell.
565. Eliptical column of granite; taken from a Quarry at Hallowell.
566. Granite—composed chiefly of feldspar; Hallowell.
567. Graphic granite; Paris.
568. Graphic granite; Brunswick.
569. Same.
570. Same.

Obs. The name *Granite* has been usually applied to this stone, although it seldom contains any mica—being composed only of quartz and feldspar. *Graphic* denotes its resemblance to written characters.

PRIMARY STRATIFIED ROCKS.

Originally deposited from water; some of which have since become crystalline by the action of heat.

571. Gneiss; Hallowell.

Obs. The materials of gneiss are similar to those of granite, but they lie in regular strata or layers.

572. Gneiss—strata contorted by the action of heat and mechanical force; Bluehill.

573. Same.

574. Mica slate; Acton.

Obs. This slate, when of good quality, (as Nos. 584, 585, &c.) is useful for sidewalks, flagging stone, &c. It is composed of quartz and mica.

575. Same.

576. Mica slate; Hallowell.

577. Mica slate; Hockamock.

578. Mica slate; Salmon Falls, Lebanon.

579. Mica slate; Lebanon:

580. Same.

581. Mica slate; Bath.

582. Mica slate; Winthrop.

583. Mica slate; Belfast.

584. Mica slate; Phipsburg.

Obs. This slate answers exceedingly well for flagging stone. It can be got out in sheets, perfectly true, twenty feet long, and of any desired thickness.

585. Same.

586. Same.

587. Same.

588. Same—but a poorer variety.

589 Mica slate—a sheet bent at right angles, by the action of heat and pressure; Phipsburg.

590. Talcose slate; Scarborough.

591. Talcose slate; Jewel's Island.

592. Manganesian slate; Dodge's Mt., Thomaston.

593. Same.

594. Siliceous or flinty slate; Kittery Point.

595. Same.

596. Siliceous slate; Piscataquis Falls.

597. Same.

598. Novaculite; Little Deer Isle.

OBS. This is a compact kind of slate, which will make excellent oil stones, hones, &c.

599. Same.

600. Same.

601. Slate, partly changed to jasper; Western Isle, Penobscot Bay.

602. Same.

603. Chert—a mineral produced by the action of trap upon slate containing lime; Deer Isle.

604. Jasper and chert; Little Deer Isle.

605. Quartz rock; Kennebunk.

606. Calciferous quartz rock; Biddeford.

607. Same.

608. Quartz rock; Biddeford.

609. Quartz rock; Bangor.

TRANSITION SERIES.

610. Pyritiferous slate; Jewel's Island

OBS. The alum and copperas of commerce is made chiefly of this rock. Nos. 843 and 844, are specimens of alum and copperas made at Jewel's Island. (See obs. 125.)

611. Same.

612. Pyritiferous slate, or alum rock; Brooksville.

613. Veins and crystals of iron pyrites in argillaceous slate; Brooksville.

614. Pyritiferous slate; Brooksville.

615. Pyritiferous slate; Brooksville.

616. Native alum and copperas in slate, resulting from the decomposition of iron pyrites, or sulphuret of iron; Brooksville.

617. Pyritiferous slate; Hampden.

618. Pyritiferous slate—slate coated with iron pyrites; Portland.

619. Pyritiferous slate; Fort Point, Penobscot River.

620. Pyritiferous gneiss; Buckfield.

621. Slate; Palmyra—Mr. Coolidge.

622. Argillaceous slate; Castine.

623. Argillaceous slate; Penobscot river—north from Belfast.

624. Slate; Limerick—loose piece.

625. Argillaceous slate; Brewer.

626. Argillaceous slate; large sheet from Barnard.

Obs. This is an excellent slate for roofing and writing slates. It is found in large quantities at Barnard, Williamsburg, Foxcroft, and Brownville—and now sells at Boston, for twenty-seven dollars a ton. This is the price of the Welch slate, which has hitherto been exclusively used.

627. Same.

628. Same, smoothed and framed—presented by Edward Smith, agent to the Co.

629. Roofing slate; Barnard.

Obs. These are the common size, used for roofing—one thousand of them make a ton, which will cover four hundred square feet.

630. Same.

631. Same.

632. Same.

633. Same.

634. Slate; from Wales, Great Britain.

635. Same.

636. Blue limestone; Crockett's Quarry, Thomaston.

637. White granular limestone; Crockett's Quarry.

638. Limestone; Phipsburg Basin.

639. Dolomite or magnesian limestone; Cochran's Marsh Quarry, East Thomaston.

Obs. This stone contains about forty-three per cent. of carbonate of magnesia and fifty-three per cent. of carbonate of lime—makes a hot lime.

640. Polished specimen of the same.

641. Limestone; Paris.

642. Limestone; Gray's farm, Paris.

643. Limestone; Andrews' farm, Paris.

644. Limestone: Davis' Mt. Paris.

645. Limestone in gneiss—strata contorted by the action of heat and pressure; Bluehill.

646. Same.

647. Limestone—strata contorted; Hallowell—Morgan's farm.

648. Limestone; Bluehill.

649. Same.

650. Limestone; Norway.

651. Limestone; south part of Norway.

652. Same.

653. Limestone; Davis' farm, Newfield.

654. Limestone; Newfield.

655. Same.

656. Same.

657. Limestone; Buckfield.

658. Same.

659. Same.

660. Limestone; Palmyra—Mr. Coolidge.

661. Argillo-ferruginous limestone; Hampden.

662. Limestone; Canaan Mills—W. Coolidge.

663. Limestone; Bucksport.

664. Limestone; Bowles' farm, Winthrop.

665. Pebbles cemented together by carbonate of lime, which was held in solution in water. A recent sandstone; Bangor.

MINERALS AND ORES.

666. Quartz crystals; Waterford.

667. Quartz crystals; Crotch Island, Casco Bay.

668. Same.

669. Quartz crystals; Hockamock.

670. Quartz; Herring Island.

671. Rose Quartz; Paris.

Obs. This mineral in ancient times, was manufactured into goblets, &c., but is not used at present. It loses its color by exposure to the light.

672. Same.

673. Same.

674. Quartz crystals and chabasie? Phipsburg.

675. Hornstone; Deer Island—loose piece.

676. Mica; Paris, Oxford County.

Obs. This mineral is applied to many useful purposes. It is manufactured into lanterns, for which it is well suited by its transparency and property of withstanding a strong heat, which also render it suitable for the windows of anthracite coal stoves. In Russia, it is used for windows, instead of glass; also in vessels of war, as it is not broken by concussion from the firing. It is used, too, for compass cards, being perfectly true, and not subject to warp; for shades for lamps where the heat is intense, &c. &c. &c.

677. Same.

678. Same.

679. Same.

680. Same.

681. Mica, containing crystals of green tourmaline, a substance sometimes used in jewelry; Paris, Oxford County.

682. Same.

683. Same.

684. Same.

685. Quartz, mica, and green tourmaline; Paris.

686. Black mica in quartz and feldspar; Brunswick.

687. Lepidolite; Paris, Oxford County.

Obs. This mineral is not now much used. It is susceptible of a good polish, and has formerly been manufactured into cups, &c.

688. Same.

689. Same.

690. Lepidolite; from boulder in Waterford.

691. Feldspar; Paris, Oxford County.

Obs. *Feldspar* is valuable for making the nicer kinds of porcelian and artificial teeth. All the mineral teeth are made principally of feldspar.

692. Same.

693. Same.

694. Feldspar; Herring Island.
695. Feldspar; Hallowell.
696. Feldspar; Brunswick.
697. Same. (See obs. 691.)
698. Beryl; Georgetown.

Obs. Small and delicate crystals of this mineral are called emerald, and are used in jewelry.

699. Crystal of beryl; from Paris.
700. Small beryl and garnet in granite; Paris.
701. Cinnamon stone, or yellow garnet; Phipsburg.
702. Crystal of garnet—form rhomboidal dodecaedron; Parsonsfield.

Obs. Garnets of good color are used in jewelry.

703. Cinnamon stone, or yellow garnet; Phipsburg.
704. Same.
705. Crystals of yellow garnet; Phipsburg.
706. Manganesian garnet; Phipsburg.
707. Garnet and egeran; Phipsburg.
708. Garnet, pargasite and egeran; Phipsburg.
709. Same.
710. Garnets and small beryl in granite; Paris.
711. Garnets in granite; Buckfield.
712. Same.
713. Large garnet; Buckfield.
714. Same.
715. Same.
716. Same, in iron ore; Buckfield.
717. Garnet and axinite ? Phipsburg.
718. Garnets in quartz and feldspar; Brunswick.
719. Same.
720. Garnets in granite; Strong, Me.
721. Egeran in large crystals; Parsonsfield.
722. Same.
723. Same.
724. Egeran and quartz; Parsonsfield.

725. Egeran and garnet; Phipsburg Basin
726. Egeran in separate crystals.
727. Black tourmaline in quartz and feldspar. (See obs. 731.) Paris, Oxford County.
728. Black tourmaline; Paris.
729. Same.
730. Same.
731. Gigantic crystals of black tourmaline in quartz; Paris, Oxford County.

Obs. This mineral has often been mistaken for coal, but it possesses none of the properties of coal, and is only found in rocks, where coal is never known to exist.

732. Black tourmaline in quartz; Herring Cove Island.
733. Black tourmaline; Long Cove, Bluehill.
734. Same.
735. Green tourmaline, albite and quartz; Paris.
736. Green and red tourmaline, (or rubellite,) albite and quartz; Paris.
737. Green tourmaline in quartz and feldspar; Paris.
738. Green tourmaline, quartz and feldspar; Paris.
739. Green tourmaline in lepidolite; Paris.
740. Indicolite (or blue tourmaline,) albite, and quartz; Paris.
741. Lepidolite, indicolite, albite, and quartz; Paris.
742. Hornblende in diallage, from a loose piece in Corinth.
743. Hornblende in granite; Boothbay.
744. Crystals of macle (boulder;) Bangor.
745. Same.
746. Andalusite in mica slate; Bangor.
747. Asbestus; Deer Isle.

Obs. This mineral, when of good quality, is woven into cloth and made into purses, &c. It is not affected by the fire, and may be useful for fire-proof safes, &c. Incombustible paper may be made of it.

748. Staurotide in mica slate; Winthrop.
749. Magnetic iron ore, with serpentine; Isle au Haute.
750. Same.

751. Vein of iron ore in granite; **Herring Gut Island.**
752. Magnetic iron ore; **Buckfield.**
753. Same.
754. Same.
755. Same—variety.
756. Variety of the same.
757. Magnetic iron ore; **Jackson, N. H.**
758. Magnetic iron ore; **from a loose piece in Phillips—(by Dr.** Prescott of Farmington.)
759. Bog iron ore; **Shapleigh.**
760. Bog iron ore; **Shapleigh.**
761. Bog iron ore; **Paris.**
762. Same.
763. Bog iron ore; **Bluehill.**
764. Bog iron ore; **Saco.**
765. Same.
766. Bog iron ore; **Jewel's Island, Casco Bay.**
767. Same.
768. Same.
769. Ferruginous slate; **Jewel's Island.**
770. Bog iron ore; **Dover.**
771. Bog iron ore; **Lebanon.**
772. Bog iron ore; **No. 6, R. 9, above Williamsburg.**
773. Ferruginous tufa, at junction of trap and slate; **Hampden.**
774. Ferruginous sandstone; **Passadumkeag.**
775. Black ferruginous sand; **Great Androscoggin Pond, Leeds.**
776. Crystalline cast iron; from under the hearth of a furnace at Newfield. It remained half fused for a number of years, so that the particles had time to take a crystalline form. The crystals are octædrons.
777. Arsenical iron; **Bluehill.**
778. Same.
779. Arsenical iron; **Bond's Mt., Newfield.**
780. Silicate of manganese—a new variety; **Bluehill.**
781. Same
782. Same.

783. Black oxide of manganese; Bluehill.

784. Black oxide of manganese; Paris.

785. Bog manganese; Bluehill.

786. Bog manganese; Paris.

787. Bog manganese; Agamenticus.

788. Iron pyrites or sulphuret of iron; from Greenwood.

789. Pyrites in slate; Brooksville. (See 610.)

790. Pyrites in quartz rock; Brooksville.

791. Alum rock; Buckfield.

Obs. This stone is formed from the natural decomposition of iron pyrites and slate—forming a sulphate of alumina or alum.

792. Tungstein or wolfram and sulphuret of molybdenum; Bluehill.

Obs. *Tungstein* is composed of tungstic acid and iron—is useful for the manufacture of tungstic acid—is very rare in this country, and seldom found anywhere except in connexion with tin. (For molybdenum, see 794 obs.)

793. Same.

794. Sulphuret of molybdenum in granite; Bluehill.

Obs. This metal is of no great value. It is used only for making molybdic acid.

795. Same.

796. Same.

797. Galena or sulphuret of lead—crystalline in form; Parsonsfield.

798. Same.

799. Yellow blende or sulphuret of zinc in quartz rock; Parsonsfield.

800. Same, with sulphuret of copper.

801. Sulphuret of zinc in quartz; Parsonsfield.

802. Copper pyrites or sulphuret of copper, blende or sulphuret of zinc, and galena or sulphuret of lead, and quartz crystals; Parsonsfield.

803. Galena, sulphuret of lead; Bluehill.

804

805. Calcareous spar, in rhomboidal crystals; Thomaston.

806. Calcareous spar in low six-sided prisms—colored by iron; Thomaston.

807. Same.

808. Phosphate of lime; Long Island, Bluehill.

809. Phosphate of lime; Waterford.

810. Same.

811. Stellated gypsum; Nova Scotia.

812. Fluor spar; Bluehill.

Obs. This substance is used in Chemistry for making fluoric acid. It is also worked into a variety of ornaments.

813. Same.

814. Same.

815. Same.

816. Same.

817. Same—with quartz crystals.

818. Same—with sulphuret of molybdenum.

819. Graphite; Greenwood.

Obs. This is often, but incorrectly, called black *lead*, or plumbago. It is useful for making *lead* pencils, which however contain not a particle of *lead*—and it is used for making fire-proof crucibles.

820. Same.

821. Chert; Little Deer Isle, (see 603.)

822. Recent bituminous coal, taken from under a peat bog in Limerick—and is one of the proofs of the vegetable origin of coal, being a stage in the progress of peat into bituminous coal.

823. Anthracite; Vinalhaven, Northern Island.

Obs. It is found in small quantities in slate, which has been altered by action of trap.

824. Terebratulæ in compact slate; from a loose rock.

825. Same.

826. Terebratulæ in quartz rock; Parsonsfield.

827. Terebratulæ, lingula ? from a loose rock in Cornville—by Benjamin McDaniel.

828. Concretions from the clay, at Presumpscot Falls, Westbrook, (see obs. No. 376.)
829. Concretions of clay, inclosing the nucula portlandica; Presumpscot Falls, Westbrook, (see obs. No. 376.)
830. Clay containing impressions of nucula portlandica, Bangor.
831. Concretions of clay iron stone; Haithorn Meadow, Bangor.
832. Plastic clay; North Turner.

Obs. Best kind of clay for pottery.

833. Same.
834. Hydrate of silica, a delicate kind of clay composed almost entirely of silex—suitable for making fire-proof brick—(which see No. 838.)
835. Same.
836. Same—from Bluehill.
837. Hydrate of silica; Bluehill. (See obs. No. 834.)
838. Fire-proof brick made of the hydrate of silica and sand from Bennington, Vermont.
839. Fuller's earth; Newfield.

Obs. This is useful for cleansing cloth, &c.

840. Same—from Parsonsfield.
841. Wood preserved under peat. The woody fibres still remain, though every other part is gone; Waterford—W. Coolidge.
842. Yellow ochre; Jewel's Island. Useful for manufacturing paint.
843. Alum and copperas made from the pyritiferous slates of Jewel's Island. (See Nos. 125 and 610.)
844. Same.
845. Crystals of scapolite and pyroxene; Raymond—by Rev. A. P. Chute.
846. Tremolite with magnetic iron—by Rev. A. P. Chute; Raymond.
847. Egeran; Poland—by Rev. A. P. Chute.
848. Honblende; Raymond—by Rev. A. P. Chute.
849. Jasper, with crystals of silicate of iron; Monmouth—by N. T. True.

SPECIMENS

COLLECTED ON THE PUBLIC LANDS—1836-7.

ROCKS UNSTRATIFIED AND OF IGNEOUS ORIGIN.

850. Greenstone Trap; Peaked Mt., Seboois River. (See No. 1.)
851. Greenstone trap; three miles below Dalton's, Aroostook River.
852. Greenstone trap; Rippogenus Island.
853. Greenstone trap; outlet of Chamberlin Lake.
854. Greenstone trap; Aroostook Falls.
855. Greenstone trap; Monument Line, East Branch Penobscot.
856. Porphyritic greenstone trap; foot of Chesuncook Lake.
857. Porphyritic greenstone trap; foot of Chesuncook Lake.
858. Breccia of trap and limestone—boulder; New Limerick.
859. Amygdaloidal trap; Baskahegan Lake.
860. Amygdaloidal trap—boulder; opposite Peaked Mt , Seboois River.
861. Same.
862. Amygdaloidal trap, in place; Pongokwahem Lake.
863. Hornstone; Mt. Kenio, Moose Head Lake.

   Obs. The whole mountain is composed of this stone, which is like flint in appearance and composition.

864. Same.
865. Hornstone; Sugar Loaf Mt., Seboois River.

   Obs. The stone is here found at point of contact of the greenstone trap, which forms the top of the mountain, and of the slates, which lie on its sides.

866. Jasper breccia; Sugar Loaf Mt.

   Obs. This is found under the same circumstances, and is evidently of the same origin as the preceding.

867. Same.

868. Granite; Lincoln, Penobscot River.

869. Granite; two miles above Katepskenhegan Pond, Penobscot River, West Branch.

870. Granite; West side of Katepskenhegan Pond.

871. Granite; Gibson's Clearing, near the mouth of the Sowadnehunk, Penobscot River.

872. Granite—boulder; Calais and Houlton Road, on No. 8.

PRIMARY STRATIFIED ROCKS,

Originally deposited from water; some of which have since become crystalline by the action of heat.

873. Micaceous slate; from an Island in Moose Head Lake.

874. Micaceous slate; from the southwest shore of Moose Head Lake.

875. Quartz rock; Chesuncook Falls.

876. Siliceous slate; southwest part of Lincoln.

877. Compact siliceous slate; near the Grand Falls, on the East Branch of the Penobscot.

878. Compact siliceous slate; below the Grand Falls, on the East Branch of the Penobscot.

879. Compact siliceous slate; below the mouth of the Seboois, East Branch Penobscot.

880. Compact siliceous slate; foot of Chesuncook Lake.

881. Same.

882. Siliceous slate; one mile below Mattawamkeag, Penobscot River.

883. Silceous slate; foot of Temiscouata Lake.

884. Siliceous slate; Inlet of Shad Pond.

885. Praze and plumbaginous slate; E. Branch of the Penobscot.

886. Praze; East Branch Penobscot.

887. Plumbaginous slate; Moose Head Lake.

888. Same.

TRANSITION SERIES.

889. Argillaceous slate; Aroostook Road.
890. Limestone—a bed in argillaceous slate; Aroostook River.
891. Slate-contorted strata; Tobique River.
892. Same.
893. Compact slate; No. 2, Indian Township, Calais and Houlton Road.
894. Compact slate; Baileyville.
895. Slate; Hodgdon.
896. Slate; Madawaska.
897. Slate; Grand Falls, Penobscot.
898. Same.
899. Slate; Chesuncook Portage.
900. Green slate; Chesuncook Falls.
901. Green slate; above Sugar Loaf Falls, Seboois River.
902. Red slate; above Sugar Loaf Falls, Seboois River.
903. Same.
904. Calciferous slate—greywacke formation; Moose Head Lake.
905. Calciferous slate—greywacke formation; Moose Head Lake.
906. Same.
907. Madrepore in greywacke slate; southwest side of Moose Head Lake.
908. Madrepore limestone; Rippogenus Falls, Penobscot River.
909. Hydraulic limestone; Rippogenus Falls, Penobscot River.
910. Brecciated Marble; Rippogenus Falls.
911. Conglomerate, or greywacke; Lake Pongokwahem, Allagash River.
912. Greywacke—boulder; N. Limerick.
913. Greywacke; Weston—loose. (Compact variety.)
914. Conglomerate, or coarse greywacke; Weston.
915. Greywacke slate; Baskahegan Lake.
916. Greywacke; top of Mars Hill.
917. Greywacke; top of Mars Hill.

918. Slate—greywacke formation; foot of Mars Hill.
919. Greywacke—boulder; near mouth of Ulmquegan, Seboois River.
920. Greywacke; opposite Peaked Mountain, Seboois River.
921. Same.
922. Same.
923. Same.
924. Greywacke slate; opposite Peaked Mt., Seboois River.
925. Greywacke slate; opposite Peaked Mountain, Seboois River.
926. Greywacke—boulder; Aroostook River.
927. Greywacke—boulder; Schoodic Lake.
928. Greywacke—boulder; Baskahegan Lake.
929. Greywacke—boulder; Calais and Houlton Road.
930. Conglomerate of quartz, chalcedony, jasper and limestone—boulder; St. John River.
931. Same.
932. Greywacke, containing terebratulæ and vegetable remains; Aroostook River.
933. Same.
934. Fossil favosite in greywacke; Aroostook River.
935 Carbonaceous slate; Dalton's, Aroostook River.
936. Same.
937. Same.
938. Greywacke; Temiscouata Lake.
939. Old red sandstone; Jerry Brook, Seboois River.
940. Same.
941. Ferruginous slate; Hodgdon.
942. Red ferruginous slate; Hodgdon.
943. Red ferruginous slate—boulder; opposite Peaked Mt., Seboois River.
944. Red ferruginous slate; Woodstock, N. B.
945. Same.
946. Hematitic iron ore; Woodstock, N. B. (See obs. 949.)
947. Same.
948. Hematitic iron ore; Aroostook River.

949. Hematitic iron ore; Aroostook River.

Obs. Though this ore contains no more than fifty-three per centum of iron, it is considered the most valuable kind of iron ore.

950. Iron ore; Hodgdon.

951. Same.

952. Greywacke slate; Temiscouata Lake.

953. Same.

954. Greywacke, containing madrepores; Temiscouata Lake.

955. Same.

956. Compact limestone or clinkstone; New Limerick.

957. Compact blue limestone; New Limerick.

958. Compact limestone, with veins of carbonate of lime; New Limerick.

959. Same—polished.

960. Same.

961. Limestone, with veins of carbonate of lime; Aroostook Falls.

962. Compact blue limestone; Aroostook River.

963. Same.

964. Compact limestone; Aroostook River.

965. Limestone; Dalton's, Aroostook River.

966. Limestone; River St. John—strata worn by the river.

967. Limestone; Tobique river—bed in slate.

968. Same.

969. Limestone; south branch of the Meduxnekeag—Houlton.

970. Same.

971. Limestone—boulder; opposite Peaked Mt., Seboois River.

972. Fossiliferous limestone—loose; River St. John.

973. Same.

974. Madrepore limestone—boulder; opposite Peaked Mt., Seboois River.

975. Same.

976. Madrepore limestone; No. 7, 7th Range.

977. Same.

978. Same.

979. Madrepore limestone; No. 7, 7th Range.

980. Limestone—strata bent by action of trap; No. 7, 7th Range, Seboois River. Polished specimen.

981. Brecciated marble, with scoriaceous trap, which cements the fragments of limestone together; No. 7, 7th Range.

982. Brecciated marble; No. 7, 7th Range. The stone is broken up into fragments by the action of trap.

983. Same.

984. Ferruginous limestone; No. 7, 7th Range.

985. Sandstone, containing carbonate of lime—boulder; Peaked Mt., Seboois River.

SECONDARY SERIES.

986. New red sandstone; Tobique River, New Brunswick.

987. Coarse red sandstone; Tobique River.

988. New red sandstone—boulder; St. John River, N. B.

989. Gypsum or "Plaster rock;" Tobique River, N. B.

990. Same.

991. Fibrous Gypsum; Tobique River.

992. Fibrous and massive gypsum; Tobique River, N. B.

993. Fibrous and massive gypsum; Tobique River.

994. Same.

995. Same.

Tertiary and recent formations.

996. Ferruginous sandstone; Aroostook River.

997. Clay, containing phosphate of iron; Madawaska.

998. Same.

999. Ferruginous sand; Madawaska.

1000. Bog manganese; Aroostook River.

Minerals, &c.

1001. Milky quartz—bed in slate; foot of Long Falls, Allagash River.

1002. Chert; Aroostook Falls.

1003. Carnelian—boulder; Aroostook River.

1004. Carnelian—boulder; St. John River.

1005. Same.

1006. Same.

OBS. This stone is similar to that brought from the East Indies, which is used in jewelry.

1007. Jasper—a precious stone; St. John River.

1008. Same.

1009. Jasper—boulder; Aroostook River.

1010. Same.

1011. Jasper—boulder; Aroostook River.

OBS. This specimen shows the slaty structure of the rock, from which it was evidently derived—slate.

1012. Jasper with vein of iron; near the head of Seboois River—boulder.

1013. Jasper; Sugar Loaf Mountain, Seboois River.

1014. Green feldspar—boulder; St. John River.

1015. Compact feldspar; Peaked Mt.

1016. Compact feldspar and quartz; below Jerry Brook, Seboois River.

1017. Tourmaline in quartz and feldspar; Burnt Jacket, Moose Head Lake.

1018. Macle—boulder; St. John River.

1019. Same.

1020. Macle in slate—boulder; Oldtown.

1021. Sulphuret of iron in altered greywacke; Sugar Loaf Mt.

1022. Oolite; No. 7, 7th Range.

1023. Limestone—boulder; Chesuncook Lake.

1024. Brecciated marble with terebratulæ—boulder; Aroostook River.

1025. Terebratulæ in limestone; Houlton.

1026. Terebratulæ; Rippogenus Falls, Penobscot River.

1027. Terebratulæ; four miles below Rippogenus.

1028. Terebratulæ in greywacke; No. 7, 7th Range.

1029. Lydian stone or touchstone—boulder; Aroostook River.

1030. Sandstone, found at the bottom of the Bay of St. Lawrence, near Prince Edward's Island, under thirty-five fathom, of water. Nothing is known as to the cause of the holes with which it is filled. Presented by Mr. William K. Weston, of Augusta

CATALOGUE

OF SOILS

COLLECTED IN THE YEAR 1837.

1031. Soil produced by the disintegration of Porphyry; Buck's Harbor.

1032. Soil from granite; Black's Island, Mt. Desert.

1033. Soil from sienite rocks; Mt. Desert.

1034. Soil from granite; Eden, Mt. Desert—S. Higgins' farm.

1035. Soil from sienite; Wells.

1036. Soil, from Black's Island—granite.

1037. Soil from sienite; Wass' farm, Addison.

1038. Soil from slate; Searsmont.

1039. Soil from slate; near iron bed, Aroostook River.

1040. Soil from limestone and gneiss, producing twenty-five bushels of wheat to the acre; Andrews.

1041. Soil from talcose slate; Thomaston.

1042. Soil from disintegration of slate; Searsmont.

1043. Soil from limestone and slate; New Limerick.

1044. Alluvial sand from granite; Long Pond, Waterford.

1045. Diluvial soil from granite; Conant's Mills, Hope.

1046. Soil from disintegration of slate limestone; St. Albans, Somerset County—Dr. Holmes.

1047. Alluvial soil; Ox Bow, Aroostook River.

1048. Alluvial soil; Hooper's, Aroostook River.

1049. Alluvial soil; Beckwith's, Aroostook River.

1050. Disintegrated red sandstone; Perry.

1051. Diluvial sand and gravel; Conant's Mills, Hope.

1052. Ferruginous soil, from sienite; Jonesport.

1053. Soil from hematite and slate; Aroostook River.

1054. Soil from ferruginous limestone; No. 7, 7th Range.

1055. Ferruginous soil; Jacob Osgood—Bluehill.

1056. Coarse red ochre; Bluehill.

1057. Yellow oxide of iron and clay; Union Falls, (Saco River,) Hollis.

1058. Ferruginous sand; Madawaska.

1059. Soil from limestone.

1060. Soil from dolomite; Cochran's Quarry, Thomaston.

1061. Soil over limestone; Conant's Mills, Hope.

1062. Soil from limestone; Lily Pond, Camden.

1063. Diluvial soil; Hiram.

1064. Soil, good for Canada corn; Hubbard's farm, Acton.

1065. Corn soil—eighty bushels to the acre—clay two feet below; Mr. Emery—Saco.

1066. Soil over slate; Searsmont.

1067. Soil near Fuller's earth; Davis' farm, Newfield—(corn.)

1068. River sand; Aroostook River.

1069. Soil; Fairbanks', Aroostook River. (Luxuriant.)

1070. Goss' veg. soil; Aroostook River.

1071. Marl; Judge Read—Belfast.

1072. Moses Emery—corn field—clay four feet below; Saco.

1073. Gravel from beach; Bluehill.

1074. Soil seven feet below surface; New Limerick.

1075. Soil, good for corn; Scarborough.

1076. Soil from Saco—good for oats.

1077. Soil over slate; Searsmont.

1078. Sand; from beach at Dyer's Neck, Biddeford.

1079. Uncultivated soil, good for wheat and grass; W. Coolidge, Waterford.

1080. Soil from Gibbs Tilton, Jackson.

1081. Soil from the hill back of the shore village, Thomaston. Rocks in place, mica slate charged with manganese and iron.

1082. Soil over lime rock, at Marsh Quarry, Thomaston.

1083. Soil over lime rock, at Marsh Quarry, Thomaston.

1084. Soil remarkable for fine potatoes; Wiscasset.

1085. Soil occurring immediately over gneiss rock, Wiscasset.

1086. Soil remarkable for potatoes and grass; Wiscasset.
1087. Uncultivated soil; Westport.
1088. Soil from Phipsburg—Dea. Hutchins.
1089. Decomposition of talcose rock; Thomaston.
1090. Soil from Surry, No. 3.
1091. Soil from Surry, No. 1.
1092. Soil from Surry, No. 2.
1093. Soil; B. D. Boise—Canada Road.
1094. Soil from shells; Newcastle.
1095. Clay loam; T. Barstow, Brewer. Wheat luxuriant, dressed with lime.
1096.
1097. Soil; J. McCully, Wilton. Wheat forty-eight bushels to acre.
1098. Soil; I. Haines, Bethel. Grass, one and a half tons to the acre, dressed with barn manure.
1099. Soil; S Stephenson, Gorham. High ground, not dressed for ten years.
1100. Soil; Mr. Stephens, Foxcroft. Wheat, luxuriant.
1101. Soil; Dresden—clover and herd's grass—one and a half tons to the acre.
1102. Soil; from above decomposed limestone, Farmington Hill.
1103. Soil; Mr. Jordon, Saco—No. 1, cleared.
1104. Soil; Warren—Mr. Fish. Wheat, good.
1105. Soil; William S. Mahew, Foxcroft. Bald wheat.
1106. Soil; Thomaston—north of B. W. Lime Quarry. Wheat.
1107. Red soil; from decomposed hematite, Aroostook.
1108. Soil; Orrington. Clay loam—wheat.
1109. Muck, from bog iron; Mr. Bryant, Anson.
1110. Soil; E. G. Belcher, Farmington—corn.
1111. Soil, from the decomposition of mica slate; E. Bradford—Turner.
1112. Marsh Quarry, Thomaston.
1113. Soil; Mr. Sears—wheat—Glenburn.
1114. Corn; Mr. Wood, Rumford—one hundred bushels to acre.

1115. Alluvial soil; B. Bryant, Anson. Wheat turns yellow on it.

1116. Wiscasset growth potatoes.

1117. Soil; Mr. King's farm, Kingfield—never dressed.

1118. Soil; O. Pray, Livermore. Wheat, thirty bushels to the acre.

1119. Serpentine soil; Deer Isle.

1120. Soil; Mr. Burell, Clinton—corn.

1121. Soil, over limestone; Clinton.

1122. Soil; S. Stephenson, Gorham. Low clay ground—never dressed.

1123.

1124. Soil; J. Little, Minot. Corn and grass, luxuriant.

1125. Soil; I. Smith, Norway. Corn, fifty bushels to the acre; dressing, barn manure.

1126. Yellow loam; B. Boies, Canada Road.

1127. Soil; Dr. Bates' plain, Norridgewock. Oats, peas, luxuriant.

1128. Soil; Dr. Bates' plain, Norridgewock. Wheat, luxuriant.

1129. Soil; Mr. Gleason's, Thomaston Beech—growth of wood, north of the Lime Quarry.

1130. Soil, over bog iron; Bucksport.

1131. Soil, E. Little, Danville. Grass.

1132. Soil; Minot, S. Berry. Herd's grass and Clover

1133. Soil; I. Brigg's, Danville. Corn.

1134. Sand; Sebago Lake, Raymond.

1135. Soil; Dr. Burleigh, Dexter. Oats, four feet high.

1136. Soil; E. Stetson, Minot. Corn and wheat.

1137. Soil, uncultivated; Dr. Bates' plain, Norridgewock.

1138. Soil; I. Washburn, Livermore. Clover, two tons per acre.

1139. Soil; L. Levensaler, Thomaston. Wheat, twelve loads of muscle mud to the acre.

1140. Soil from decomposed limestone; Farmington.

1141. Soil; S. Berry, Minot. Clover and herd's grass.

1142.

1143. Soil; Guilford. Oats.

1144. Soil; Mr. Chandler's, Sebec. Wheat, luxuriant.

1145. Soil; E. Little, Danville. Corn, forty bushels to acre. Wheat, twenty to twenty-five.

1146. Soil; Col. Morrill's farm, Dixfield. Grass and grain.—One hundred bushels of oats to the acre.

1147. Soil—wheat; B. Bryant, Anson.

1148. Soil; E. Little, Danville. Corn, forty bushels to acre—wheat, twenty.

1149. Smut dust, from wheat; Foxcroft Mts.

1150. Soil; Alna—white maple.

1151. Clay loam; Orrington. Wheat, good.

1152. Soil; B. Bryant, Anson. Clover and herd's grass.

1153. Soil; Dr. Burleigh, Dexter. Oats, luxuriant.

1154. Soil; corn and wheat—forty bushels of corn to the acre—twenty-five of wheat; T. B. Little's, Minot.

1155. Soil; E. T. Little, Minot. Grass, one and a half tons per acre.

1156. Soil; I. Haines, Bethel. Corn, forty bushels to the acre, dressed with barn manure.

1157. Soil, from decomposition of mica slate; Turner.

1158. Soil; eight miles from Bingham, on Canada Road—mixture of hard and soft wood.

1159. Soil; I. Foster, Avon. Corn.

1160. Soil; J. Ham, Bangor—uncultivated.

1161. Soil—bald wheat; Sebec Village.

1162. Soil; P. C. Harding, Union. Grass, forty bushels to acre.

1163.

1164. Soil; Danville. Grass, very poor.

1165. Soil; Mr. Green, Dexter. Wheat, luxuriant.

1166. Aroostook river; P. Bull's farm.

1167. Talcose slate soil; Thomaston.

1168. River sand; Aroostook.

1169. Beach sand; Dyer's Neck.

1170. Waterford wheat; T. Stone's farm.

1171. William Coolidge's farm, Waterford.

1172. W. Coolidge's farm, Waterford—limed.

1173. Over gneiss; Wiscasset.

1174. Near Fuller's earth, Davis' farm, Newfield.
1175. Soil; Oats—Saco.
1176. Diluvial soil; Hiram.
1177. Yellow soil; near iron mine, Aroostook.
1178. Alluvial; Oxbow, Aroostook.
1179. Phipsburg basin—Hutchins' farm
1180. Alluvial soil; Mr. Hooper's, Aroostook.

CATALOGUE

OF SPECIMENS

COLLLCTED IN THE YEAR 1838.

ROCKS UNSTRATIFIED AND OF IGNEOUS ORIGIN.

1181. Basalt, containing basaltic hornblende and olivem; Bristol.
1182. Basalt; J. Huse, Bristol.
1183. Same.
1184. Basalt; Dixfield.

Obs. The above specimens of genuine basalt are the first ever discovered in this country.

1185. Greenstone trap; west of Twichel's pond, Greenwood.
1186. Greenstone trap; E. Heath, Whitefield.
1187. Greenstone trap; Lewiston Falls.
1188. Greenstone trap; N. Bray, Poland.
1189. Greenstone trap; Solon.
1190. Feldspar rock with iron pyrites; Raymond.
1191. Feldspar rock; Raymond.
1192. Granite; Holmes' Brook, Rumford.
1193. Granite; Peavy's Mt., Rumford.
1194. Granite; Dodland Hill, Norridgewock.
1195. Same.
1196. Granite; Ludwig's Quarry, Waldoborough.
1197. Granite; Nobleborough.
1198. Granite; D. Baldwin, Mt. Vernon.
1199. Granite; Tyler's Quarry, Waldoborough.
1200. Granite; J. Knowlton, Farmington.
1201. Granite; D. Baldwin, Mt. Vernon.
1202. Granite; Rumford Falls.
1203. Granite; Day, Bristol.

1204. Granite; Chandler, Belgrade.
1205. Granite; W. Hopkins, Newcastle.
1206. Granite; J. Knowlton, Farmington.
1207. Granite; Ryant's Hill.
1208. Granite; Canada Road.
1209. Granite; Minot.
1210. Junction of granite and grauwacke; Canada Road.

PRIMARY STRATIFIED ROCKS,

Originally deposited from water; some of which have since become crystalline by the action of heat.

1211. Gneiss; Orrington.
1212. Gneiss; Mt. Blue.
1213. G. gneiss; Dresden.
1214. Gneiss; Nobleborough.
1215. Mica slate—wall rock of limestone; E. Heath, Whitefield.
1216. Mica slate; Bear Mt., Hartford.
1217. Mica slate; Lowell's Hill, Livermore.
1218. Mica slate; Mt. Vernon.
1219. Mica slate; Mt. Abraham.
1220. Mica slate; A. Starrett, Warren.
1221. Mica slate; Lewiston Falls.
1222. Mica slate; Dresden.
1223. Mica slate; Solon.
1224. Mica slate; Rumford.
1225. Mica slate; Moose Head Lake.
1226. Mica slate; Rumford Falls.
1227. Slate coated with gypsum; Bloomfield.

TRANSITION SERIES.

1228. Quartz rock, containing mica; Seven Mill Brook, Anson.
1229. Quartz rock; near Parlin Pond, Canada Road.

1230. Grauwacke slate; between Boies's and Forks Kennebec.
1231. Grauwacke slate; Gen. Robinson, Waterville.
1232. Grauwacke slate; Norridgewock Falls.
1233. Calciferous slate; Forks Kennebec.
1234. Novaculite; Phillips.
1235. Same.
1236. Slate in compact grauwacke; west of Parlin Pond, Canada Road.
1237. Arsenical Pyrites; Titcomb's Hill, Farmington.
1238. Slate; Winslow, below Falls.
1239. Slate; from the height of land between Maine and Lower Canada.
1240. Slate; Bangor.
1241. Slate; Elliotsville.
1242. Argillaceous slate; Gen. Robinson, Waterville.
1243. Argillaceous slate; west side river, Farmington.
1244. Argillaceous slate; Mt. Abraham.
1245. Compact slate; west Parlin Pond, Canada Road.
1246. Slate; Solon.
1247. Pyritiferous slate; Bingham.
1248. Pyritiferous slate; Gov. King, Bluff Mt., Concord.
1249. Pyritiferous slate; Corinna.
1250. Pyritiferous slate; Churchill's, New Portland.
1251. Pyritiferous slate; Bluff Mt., Concord.
1252. Pyritiferous slate; Titcomb's Hill, Farmington.
1253. Slate with iron pyrites; Winslow.
1254. Pyritiferous slate; M. Hoxie, Albion.
1255. Pyritiferous slate; W. Collins, Harmony.
1256. Same.
1257. Impressions of fern; Waterville.
1258. Same.
1259. Slate with impressions of fuci; Waterville.
1260. Impresssions of fuci; Winslow.
1261. Impressions of fern, in slate; Briton, Sidney.
1262. Limestone; S. Brown, Clinton.

1263. Limestone; Witherall. Norridgewock.
1264. Limestone; Fifteen Mile Brook, Clinton.
1265. Limestone; Puffer, Dexter.
1266. Limestone; O. Brown, Vienna.
1267. Limestone; Tilson Q., Thomaston.
1268. Limestone; W. Parsons, Norway.
1269. Limestone; D. Richardson, Jay.
1270. Limestone; Old Town, Penobscot River.
1271. Limestone; Dunbar, Winslow.
1272. Limestone; P. C. Harding, Union.
1273. Limestone; I. Miller, Union.
1274. Limestone; Drummond, Winslow.
1275. Limestone; Mt. Abraham.
1276. Limestone; Furber, Winslow.
1277. Limestone; Foxcroft Falls.
1278. Sand cemented by carbonate of lime; Bangor.
1279. Limestone; I. Bean, N. Sharon.
1280. Limestone; I. Winslow, N. Sharon.
1281. Limestone; I. Winslow, N. Sharon.
1282. Limestone; I. Bean, N. Sharon.
1283. Limestone; W. Barnard, N. Sharon.
1284. Limestone; Rumford Falls.
1285. Limestone; Rumford Falls.
1286. Limestone; J Richards, Winthrop.
1287. Limestone; Williams, Waterville.
1288. Limestone; N. Bray, Poland.
1289. Limestone; G. & J. Tolman, New Sharon.
1290. Limestone, in asbestus; I. Miller, Union.
1291. Limestone; R. White, Dixfield.
1292. Limestone; J. Chapman, Mt. Vernon.
1293. Limestone; Witherum, Abbot.
1294. Limestone; Crowell, West Waterville.
1295. Limestone—loose; Industry, on Farmington Road.
1296. Limestone; Holman's, Dixfield.
1297. Limestone—loose; Pierce, Lexington.

1298. Limestone; Whitefield.
1299. Limestone; Norton's Mills, Strong.
1300. Limestone; Harmony.
1301. Limestone; Livermore Falls.
1302. Limestone; Rumford Point.
1303. Limestone; Reed, No. 2, Carthage.
1304. Limestone; Oak Hill, Turner.
1305. Limestone; Lewiston Falls.
1306. Wood, Skowhegan.
1307. Marble, containing Pyrites; Thomaston.
1308. Clouded marble; Thomaston.
1309. Blue marble; Thomaston.
1310. Dolomite marble; Thomaston.
1311. Veined marble; Thomaston.
1312. Limestone; Crowell, Dexter.

Obs. This limestone occurs in large quantities at Dexter, and contains 98 per cent. of pure carbonate of lime.

1313. Limestone; Fish, Dexter.
1314. Limestone; Jennings, Dexter.
1315. Limestone; Pullen, Dexter.
1316. Limestone; B. Starrett, Warren.
1317. Limestone; Warren.
1318. Limestone; D. Starrett, Warren.
1319. Limestone; Alexander Starrett, Warren.
1320. Limestone; east side County road, Phillips.
1321. Limestone; West side River, Phillips.
1322. Limestone; J. Whiting, Phillips.
1323. Clouded marble; D. Bullen, Union.
1324. Same.
1325, Same.
1326. Limestone; S. Davy, Turner.
1327. Limestone; E. White, Dixfield.
1328. Limestone; J. Cole, Turner.
1329. Limestone with serpentine; I. Miller, Union.
1330. Limestone; P. Barrell, Turner.

1331. Limestone; Starks.
1332. Limestone.
1333. Limestone, Athens.
1334. Limestone.
1335. Limestone; Skowhegan Falls.
1336. Limestone; James Winslow, New Sharon.
1337. Limestone; River, Guilford.
1338. Limestone; O. Brown, Vienna.
1339. Argillo-ferruginous limestone bed in slate; Hampden.
1340. Pot stone; Warren.
1341. Limestone, containing galena and blende; Warren.
1342. Limestone; E. Dennis, Harmony.
1343. Limestone, containing galena and blende; Warren.
1344. Limestone; Titcomb, Farmington Hill.
1345. Limestone; Mr. Drummond, Winslow.
1346. Limestone; Reed, No. 1, Carthage.
1347. Limestone; J. Wall, Winslow.
1348. Limestone; G. Falls, W. Waterville.
1349. Limestone; Coney, Farmington Hill.
1350. Limestone, containing lead ore; Warren.
1351. Limestone; A. Starrett, Warren.
1352. Limestone; State Prison, Thomaston.
1353. Limestone; east side County Road, Phillips.
1354. Limestone; Noyes & Crafts, Jay.
1355. Limestone; Varnum, Temple.
1356. Limestone; Crockett's Quarry, Thomaston.
1357. Limestone; Winter, Carthage.
1358. Limestone; O. Brown, Vienna.
1359. Limestone; Pullen, Dexter.
1360. Limestone; Batchelder, Union.
1361. Limestone; J. Richards, Winthrop.
1362. Limestone; E. Heath, Whitefield.
1363. Limestone; B. Winter, Carthage.
1364. Limestone; J. Waterhouse, Poland.
1365. Limestone; Sylvester, Norridgewock.

1366. Hydraulic limestone; Forks Kennebec River.

1367. Same.

1368. Limestone; Wyman, Belgrade.

1369. Limestone, containing iron pyrites; Beechwood Quarry, Thomaston.

1370. Limestone, containing iron pyrites; Beechwood Quarry, Thomaston.

1371. Soft stone; Beechwood Quarry, Thomaston.

1372. Hard stone; Beechwood Quarry, Thomaston.

1373. Marble; Thomaston.

1374. Limestone; Beechwood Quarry, Thomaston.

1375. Same.

1376. Limestone; Achorn's Quarry, Thomaston.

1377. Limestone; Brown Quarry, Thomaston.

1378. Junction of limestone and trap dyke; Thomaston.

1379. Same.

1380. Junction of limestone and trap dyke; E. Heath, Whitefield.

1381. Junction of limestone and trap dyke; Poland.

Obs. In the above specimens, the veins of trap rock are not sufficiently wide to materially alter the appearance of the limestone.

1382. Limestone; T. Simpson, Winslow.

1383. Limestone; I. Jewett's Woods, Whitefield.

1384. Limestone; J. Winslow, New Sharon.

1385. Limestone; Starks.

1386. Hydraulic limestone; Foster, Forks Kennebec.

1387. Shell marble; Starbord's Creek; Machais.

1388. Same.

1389. Soap stone; Talcose Rock, Harpswell.

1390. Soap stone; Orr's Island.

1391. Serpentine marble; Deer Island.

1392. Same.

1393. Veined marble; Morton's Cove, Lubec.

1394. Same.

1395. Marble; L'Etang, N. Brunswick.

1396. Breccia marble; Point of Maine, Machias.
1397. Blue shaded dolomite marble; Marsh Quarry, Thomaston.
1398. Dolomite marble; Union.
1399. Same.
1400. Slate; West side Kennebec—eight miles above Bingham.
1401. Same.
1402. Same.
1403. Slate; Smith's Quarry, Glenburn.
1404. Same.
1405. Same.
1406. Slate; west side of Kennebec—eight miles above Bingham.
1407. Same.
1408. Same.
1409. Slate; Miller's Quarry, Barnard.
1410. Same.
1411. Slate; Palmer's Quarry, Barnard.
1412. Slate; Miller's Quarry, Barnard.
1413. Slate; Foxcroft.
1414. Slate; west side Kennebec—eight miles above Bingham.
1415. Slate; Miller's Quarry, Barnard.
1416. Same.
1417. Same.
1418. Slate; Williamsburg.
1419. Same.
1420. Same.
1421. Slate; Quanlan's Quarry, Pushaw Lake.

Fossils of the Transition Series.

1422. Spiriferæ in compact greywacke; half a mile west Parlin Pond, Canada Road.
1423. Shells found in a boulder; four miles south Kennebec Forks.
1424. Terebratulæ in compact greywacke; near Parlin Pond, Canada Road.
1425. Turritella, terebratulæ and avicula, in compact greywacke; one half a mile east Parlin Pond, Canada Road.

1426. Terebratulæ in compact greywacke; near Parlin Pond, Canada Road.

1427. Same.

1428. Terebratulæ.

1429. Fossil shells.

1430. Terebratulæ in compact greywacke; one half a mile west Parlin Pond, Canada Road.

1431. Terebratulæ and avicula in compact greywacke; one half a mile west Parlin Pond, Canada Road.

MINERALS AND ORES.

1432. Quartz crystals; Livermore.

1433. Rose quartz; Albany.

1434. Quartz; H. Stinchfield, Danville.

1435. Granular quartz; B. Mathews, Liberty.

1436. Same.

Obs. This mineral occurs in great abundance at Liberty, and can be used to great advantage in the manufacture of glass.

1437. Strass or flint glass.

1438. Crystal glass, from Liberty quartz.

1439. Glass made of granular quartz; of Liberty, Me.

1440. Bohemian glass; Liberty quartz.

1441. Blue quartz; Bucksport. (Loose.)

1442. Quartz; Dixfield.

1443. Quartz; Mt. Abraham.

1444. Mica and green tourmaline; Paris.

1445. Feldspar; Lewiston Falls.

1446. Smoky quartz; Mt. Fuller, Boothbay.

1447. Quartz; Solon.

1448. Milk quartz; Mt. Blue.

1449. Quartz; Albany.

1450. Iron in quartz; Abbot.

1451. Milky quartz; Bangor.

1452. Feldspar and quartz; Paris.
1453. Ferruginous quartz rock; Forks Kennebec.
1454. Feldspar; Tumble-down Dick Mt., Peru.
1455. Feldspar and quartz.
1456. Feldspar; Bog Pond, Poland.
1457. Compact feldspar—(loose); Phillips.
1458. Feldspar; Bog Pond, Poland.
1459. Feldspar; Rumford.
1460. Staurotide in mica slate; Windham.
1461. Staurotido in mica slate; Winthrop.
1462. Staurotide in mica slate; Windham.
1463. Staurotide in mica slate; Mt Abraham.
1464. Staurotide in mica slate; Winthrop.
1465. Same.
1466. Staurotide in mica slate; Farmington.
1467. Staurotide; west side river, Phillips.
1468. Beryl; Albany.
1469. Fragment of beryl; Albany.
1470. Beryl; Albany.

Obs. Small crystals of this mineral are called the emerald, and much used in jewelry.

1471. Andalusite; Bingham.
1472. Andalusite; Mt. Abraham.
1473. Andalusite; Bangor.
1474. Labradorite; H. Batchelder, Union.
1475. Black tourmaline; Waldoborough.
1476. Hornblende; Raymond.
1477. Same.
1478. Feldspar and mica; Lewiston Falls.
1479. Tourmaline in quartz; Lewiston Falls.
1480. Black tourmaline in feldspar and mica; Paris.
1481. Sahlite; Rumford Point.
1482. Sahlite; Rumford.
1483. Jasper; Bristol.
1484. Jasper; Salem.

1485. Jasper; Phillips.
1486. Jasper breccia; Eddington. (Loose.)
1487. L feldspar; Nobleborough.
1488. Spodumene; Windham. (Loose.)
1489. Protogene; Winslow.
1490. Chlorite; Raymond. (Loose.)
1491. Macle; Mt. Abraham.
1492. Nodule pyrites; Morton Road River.
1493. Lepidolite; Paris.
1494. Andalusite; Bangor.
1495. Andalusite; Bingham.
1496. Epidote; Raymond.
1497. Novaculite; Varnum, Temple.
1498. Mica; Tumble-down-Dick Mt., Peru.
1499. Mica; Paris.
1500. Garnets; Rumford Point.
1501. Same.
1502. Garnets and pargasite; Rumford.
1503. Garnets in limestone; Rumford Falls.
1504. Garnets in granite; Lewiston.
1505. Garnets; Strong.
1506. Chlorite; Cross Isle, Machias.
1507. Vase, made of chlorite; Cross Island, Machias.
1508. Deorite; Phillips.
1509. Crystals of iron and arsenical pyrites; Corinna.
1510. Crystals of iron pyrites; Peru.
1511. Crystals of iron pyrites; Waterville.
1512. Compact red sandstone; Bay Chaleur.
1513. Bog iron ore; A. Hinds, No. 4, 11th Range.
1514. Bog iron ore; J. Lamb's, Argyle.
1515. Bog iron ore; Rogers, Dover.
1516. Bog manganese; Dover.
1517. Same.
1518. Native copperas; S. Morrill, Dixfield.
1519. Magnetic iron ore; Sandy River, Phillips.

1520. Magnetic iron ore; Sandy River, Phillips.
1521. Magnetic iron ore—boulder; Phillips—vein in granite.
1522. Magnetic iron ore; Davis, Raymond.
1523. Iron ore; D. Patrick, Patricktown.
1524. Yellow ochre; Wm. McCobb, Bristol.
1525. Same.
1526. Bog iron ore; A. Hinds.
1527. Bog iron ore; I. Miller, Union.
1528. Bog iron ore; Wm. McCobb, Bristol.
1529. Bog iron ore; A. Hinds, Dover.
1530. Bog iron ore; Proctor, Winslow.
1531. Bog iron ore; J. Lufkins, Rumford.
1532. Bog iron ore; E. Merrill, Andover.
1533. Bog iron; Robinson's, Foxcroft.
1534. Bog iron ore; Oak Hill, Turner.
1535. Bog iron ore; between Old Town and Argyle—loose.
1536. Bog iron ore; Starrett, Warren.
1537. Bog iron ore; H. Newton, Andover.
1538. Bog iron ore; A. Kimball, Bucksport.
1539. Bog iron ore; E. Merrill, Andover.
1540. Bog iron ore; Churchill's, N. Portland.
1541. Bog iron ore; J. Lamb's, Argyle.
1542. Bog iron ore; Greenbush—loose.
1543. Bog iron ore; Wyman's Hill, Farmington.
1544. Bog iron ore; Tollman, Thomaston.
1545. Bog iron ore; Rodger's, No. 2, 10th Range.
1546. Bog iron ore; Chase, Dixfield.
1547. Bog iron ore; Bryant, Anson.
1548. Bog iron; David Leighton, Harmony.
1549. Bog iron ore; M. Bradbury, Greenwood.
1550. Bog iron ore; Argyle.
1551. Lead ore; Jenning, Dexter.

Obs. In the above specimen, there is a very small per cent. of silver, but the veins are so narrow that the ore cannot be worked to advantage.

1552. Black blende; near Saw Mills, Bingham.

1553. Plumbago; west side river, Farmington.

1554. Plumbago; Holman's, Dixfield.

1555. Lead ore; Holt, Rumford.

1556. Plumbago; Phillips.

1557. Black lead; D. Holt, Rumford.

1558. Galena; near Saw Mills, Bingham.

1559. Pipe clay; Washington.

1560. Blue clay; Avon.

1561. Clay; Argyle.

1562. Same.

1563. Peat; J. Foster, Avon.

1564. Same.

1565. Peat; from the farm of Elias Phinney, Lexington, Mass. Sells for $8 per cord.

1566. Corn, raised with peat compost—seventy five bushels to the acre; planted from the tenth to the twentieth of May—ripe from twentieth of August, to the first September; farm of Elias Phinney, Lexington.

ERRATA IN THIRD ANNUAL REPORT ON THE GEOLOGY OF MAINE.

Page 2, 13th line from bottom for *forbade* read *forbad.*
32, 4th line from top for *mountain* read *mountains.*
69, 8th line from top after *being* insert *of.*
92, bottom line for *lower* read *upper.*
97, 14th line from top for *draftsmen* read *draftsman.*
138, 13th line from bottom for *indigenus* read *indigenous.*
139, 8th line from top for *are* read *were.*
139, 11th line from bottom for *stigmaricæ* read *stigmaricæ.*
141, 10th line from bottom for *sifted* read *silted.*
144, 11th line from top for *smelting* read *smelling.*

ERRATA IN CATALOGUES APPENDED.

No. 191, for *chrystalline* read *crystalline.*
209, for *crytalized* read *crystallized.*
227, first word should be *trilobite.*
360, (obs.) after *mixed with* insert *lime and*, and after ; but dele *with*
379, *et seq.* for *Presumpscot Falls* read *slide.*
468, (obs.) *dele ("it is also used for making a green dye.")*
776, (obs.) for *years* read *days.*
885-6, for *praze* read *prase.*
1181, for *olivem* read *olivine.*
1228, for *Seven Mill Brook* read *Seven Mile Brook.*
1492, for *Road River* read *Roach River.*

ERRATA IN BAROMETRICAL TABLE OF HON. DANIEL SEWALL.

Dec. 4, column of thermometer—sun set—for 22 read 24.
12, " " " " " 22 read 24.
13, " " " " " 38 read 26.
31, " " " " " 34 read 36.
Jan. 8, " " " (attached) " " 48 read 45.
10, " " Wind, " N. read W.
12, " " attached ther. " " 31 read 37.
15, " " Barom. " " 29.58 read 29.68.
24, " " Ther. sun rise, " 9 read 19.
" " " Barom. sunset, " 40 read 30.
Feb. 22, " " Barom. sunrise and sunset, insert 29 inches.
24, " " Ther. 1 P. M. insert 35.
Mar. 4, " " " sunset—for 28 read 36.
6, " " Barom. sunrise, " 29.65 read 29.60.
7, " " Weather—for rain read snow.
9, " " Ther. sunrise—for 15 read 25.
28, " " " 1 P. M. " 38 read 31.
29, " " Barom. " and sunset, insert 29 inches.
April 5, " " attached Ther. sunrise—for 30 read 39.
27, " " Ther. sunset, " 51 read 53.
May 13, " " Barom. sunrise, " 86 read 80.
June 15, " " Ther. 1 P. M. " 82 read 79.
30, " " attached Ther. sunrise, " 61 read 65.
July 7, " " Ther. sunset, " 57 read 74.
Aug. 5, " " " sunrise, " 30 read 62.
" " " " " sunset, " 43 read 74.
Sept. 2, " " " sunrise, " 59 read 49.
Oct. 12, " " Barom. sunset, " 84 read 89.
28, " " " 1 P. M. " 29.98 read 29.95.
Nov. 7, " " " " " 30.41 read 30.45.
23, " " Ther. " " 42 read 22.
26, " " " " " 39 read 25.
27, " " " " " 37 read 27.
30, " " " sunset, " 30 read 34.

IN REV. SOLOMON ADAMS' TABLE.

Aug. 17, column of remarks—strike out "clearing off."
Sept. 20, " " " " "chilly."

6aT

FIRST REPORT

ON THE

GEOLOGY

OF THE

STATE OF MAINE.

BY

CHARLES T. JACKSON, M. D.,

Member of the Geological Society of France; of the Imperial Mineralogical Society, St. Petersburg; of the Boston Society Natural History and Corresponding Member of the Academy Natural Sciences of Philadelphia; of the Lyceum Nat. Hist. of New York; Albany Institute; Nat. Hist. Soc., Montreal; Prov. Frank. Society;

GEOLOGIST TO THE STATE OF MAINE.

AUGUSTA:

SMITH & ROBINSON, PRINTERS TO THE STATE.

1837.

RESOLVE OF THE LEGISLATURE OF MASSACHUSETTS, PASSED MARCH 21, 1836.

Resolved, That the Governor with the advice of the Council, is hereby authorized to employ some suitable person or persons to make a Geological Survey of any lands in Maine, where such Survey, together with the various observations which the surveyors will have opportunity to make, will probably lead to a more accurate knowledge of the worth of the public domain.

RESOLVE OF THE LEGISLATURE OF MAINE, PASSED MARCH 28, 1836.

Resolved, That (in the language of our chief magistrate) a Geological Survey of this State, upon a basis commensurate with the magnitude and variety of its territory, is an enterprise that may rightfully claim the encouragement of every class of industry, as involving more or less of probable utility to each and is intimately connected with the advancement of the arts and sciences, of agriculture, manufactures and commerce.

Resolved, That the Board of Internal Improvements cause a Geological Survey of this State to be made as soon as circumstances will admit, commencing in the early part of the next summer, and they are hereby empowered to appoint and contract with some suitable person or persons to perform the same.

Resolved, That it is with pleasure we learn the intention of Massachusetts to join us in prosecuting so much of said Survey as shall pertain to the Public Lands—that we cordially embrace the opportunity of co-operating with her in this design; and that the Board of Internal Improvements are hereby directed to take such measures as may be necessary to effect this portion of the contemplated Survey.

Resolved, That it shall be the duty of the Board of Internal Improvements to lay before the Legislature, at its annual sessions, a detailed account of the progress of the Survey, together with the expenditures in prosecuting the same.

Resolved, That the person who shall be employed to make the Geological Survey, shall be required to select three complete suits of specimens of all the rocks and minerals of Maine and deposite one of them in the Public Buildings as the property of the State and also one in each College in the State.

Resolved, That the sum of Five Thousand Dollars be appropriated from the Treasury, subject to the discretion of the Board of Internal Improvements, and to be expended by them in carrying on said Geological Survey.

STATE OF MAINE.

In Board of Internal Improvements,
June 25, 1836.

Ordered, That Messrs. Hodgdon, Pilsbury, and Burnham, be authorized to contract with Charles T. Jackson of Boston, to commence a Geological Survey of the State, subject to the instructions of the President of this Board, in pursuance of a Resolve of March 28, 1836.

INTRODUCTORY REMARKS.

Geology has for its object the natural history of the earth on which we live. Its name is derived from the Greek γῆ, earth, and λόγος, a discourse, and is understood to signify the doctrine or science of the earth. This science investigates and describes the structure of our globe, the nature of its various components, and the laws, which have effected, and still continue to produce changes in its mass. It aims not only to satisfy the curiosity of the philosopher, but to be practically useful to every one, by pointing out the natural resources which the world offers to its inhabitants. Descending with the miner into the darkest subterranean recesses, it directs, by its light, his operations to their most successful results. It points out with accuracy the structure of the crust of the earth, as far as man has ever penetrated into it, and lays down general laws, by which we may be guided in searching into our great resources in the mineral kingdom.

Thus certain rocks abound in metallic ores, which exist in them in the form of beds or veins ; others are always destitute of metallic treasures, but afford in their place a supply of valuable combustibles, in the form of coal. Other rocks contain salt springs, rock-salt and gypsum, which occur in well known formations. There are many rocks also, which are valuable in their natural state, or become so after undergoing certain chemical operations. The situation, quantity and quality of such substances are questions to be decided by a geological investigation.

The architect and engineer derive much valuable information from this science, for it treats of the stability, or liability to change, evinced by exposure of rocks to the action of air and water and fire. It teaches them to avoid those substances which would cause a speedy decomposition of building stones, or deface their beauty.

Soils on which we depend for our daily bread, are known to be formed from the decomposed fragments of rocks, mixed with variable proportions of vegetable and animal matter, and their fertility depends, in a great measure, on the proportions of the mineral ingredients, which they contain. The adaptation of soils to particular kinds of plants evidently depends on their composition, as most intelligent agriculturalists must have observed.

Seeds, which had lain dormant for an unknown length of time, have been made suddenly to germinate and spring up, on treating the soil with particular mineral substances, such as lime, marl or ashes, and have astonished the farmer by their almost miraculous presence on an unexpected spot, where he had not sown the seed in question.

In order to avail himself to the utmost of the capabilities of the soil, the practical farmer should understand its nature, as taught by the geologists and chemists. Then, instead of exhausting his soil, he would continually add to its fertilizing properties. One of the chief reasons why farmers distrust what they call "book learning," as contrasted with actual experience, is found in the fact, that they do not understand the *principles*, on which the amelioration of the soil depends. If, for instance, they read in books or newspapers that lignite, containing iron pyrites, sulphate of iron, or copperas, is used in certain agricultural districts in Belgium for the purpose of improving a soil, and that great fertility is produced by it, they do not stop to consider the principles on which it acts in that country, and the nature of the soil on which it produces such favorable results, but proceed at once to the trial on their own farms, where the soil, being of a different nature, is, perhaps, rendered totally barren by the very substance that produced fertility in another country. Now in the instance which I have mentioned, which is the result of actual observation, the cause of the difference in the two cases is simply this. In Belgium, where the decomposing pyrites acts so favorably, in the production of wheat and other crops of grain, the soil is composed in a great measure of calcareous marl, which, containing carbonate of lime, exerts a chemical action on the sulphate of iron. An exchange of elements taking place, sulphate of lime, or gypsum, is formed, which is a powerful stimulant to vegetation; while sulphate of iron, or copperas, is a most noxious poison to plants, and when put upon a sandy, or clay and sand soil, destroys by its action the delicate plants, as they begin to put forth.

Some barren tracts of land, in the State of New-Jersey, have been rendered fertile by a just knowledge of the nature and action of a kind of shelly marl and green sand, which abounds in the vicinity. I have seen a sterile tract of red sandy soil, in Massachusetts, suddenly rendered fertile by the application of marl dug up from the bottom of a neighboring peat bog. In other places an acid peat soil, which was totally barren, was rendered fertile, by carting up a quantity of mud and muscle shells, from neighboring sea shore. In both these instances, the treat-

ment of the soil was indicated by geological and chemical principles. Let no intelligent farmer therefore, decry a just and rational theory : for such theories are built upon a multitude of instances, while his own observations perhaps, are made in a more limited field, and cannot be applied in other situations, where the circumstançes are different.

Agriculture may derive a great many valuable hints from geology, while at the same time the geologist should respect the experience of the practical farmer, and learn sedulously from him, the observations which he has made.

The principles of agriculture are at present exceedingly loose and uncertain, and it is on this account that I beg leave to offer the above remarks, requesting each farmer, who has the means of making researches, to experiment rationally in the amelioration of unfertile soils. No one respects more highly than I do this department of human art, and those who are laboring to advance a knowledge of its principles.

By the aid of geology, we are directed to our great mineral resources, which constitute in a measure the basis of national prosperity. Materials useful at all times, in peace or in war, should be found, if possible, within the limits of each State, that it may be prepared for all emergencies.

France was once thrown wholly on her internal resources, and nothing but the skill of her men of science, saved her from being overrun by foreign enemies. By the discovery of an abundance of saltpetre, iron, copper and lead, the genius of Berthollet, Monge, and their compeers, supplied her with the immediate means of successful defence ; while their discoveries, recorded in the archives of science, have served to aid in the defence of other countries, and among them our own during the war with Great Britain. Every State that discovers within itself the means of support and defence, strengthens by that means the whole confederacy.

Besides the immediate advantages resulting from the discovery of new substances, within the limits of the State, we may consider those arising from the check, which is given to absurd speculations in pretended valuable minerals, which may exist only in the imagination of the schemer. Maine has suffered so much from such extravagances, that I need not enter into the details of many absurd instances, which crowd my memory. There are few individuals in the State who cannot relate many examples, which have come to their knowledge, of digging and boring for coal in primative rocks, where it never exists—of working iron pyrites,

under the supposition that it was gold, or silver—of selling polished specimens of greenstone trap-rock, under the idea that it was marble, and many other such vain speculations, which have taken place, from ignorance of geology. Such absurd operations are by no means confined to Maine; they are carried on in almost every part of our country, and injure public confidence, in all proposals, to explore our mineral wealth.

Some of the instances which have come to my knowledge, were evidently fraudulent artifices, but a greater number proceeded from ignorance of the nature of the substances in question.

Every citizen of Maine feels, I doubt not, that the throng of wild speculators, who crowded the State summer before last, have injured public confidence in the real valuable resources of the State, and produced a corresponding retardation in the business and settlement of the country. Had a geological survey been made a few years earlier, this difficulty would have been prevented, so far as relates to the mineralogical resources of the State. In the course of a short time the reaction of public feeling will subside, and people will look seriously into the real mineral wealth which your State so abundantly contains, and successful operations will be commenced so as to render it available.

I have spoken of a few of the ordinary uses of Geology, by which it appears that many of the arts and manufactures are benefitted, and human wants supplied. There are, however, higher and nobler uses appertaining to this science. It opens to us the great book of nature, where we may read the eternal truths of creation, those "sermons in stones" which were written by the finger of the ALMIGHTY, and which bear indisputable proofs of his wisdom, goodness, power and omnipresence.

The world has its history written on its strata; a history so interesting, that the most splendid fictions of the human imagination sink into insignificance when compared with it, in the same measure as all human productions must, when compared with the eternal works of the Creator.

REPORT.

To His Excellency Robert P. Dunlap, Esq., *Governor of the State of Maine, President of the Board of Internal Improvement.*

Sir—In accordance with a Resolve of the Legislature of Massachusetts, passed on the twenty-first day of March 1836, I received a Commission from the Governor of that State, dated July first, of the same year, authorizing me to make a Geological Survey of the public lands, belonging jointly to the States of Massachusetts and Maine. At the same time I received proposals from the Board of Internal Improvement in Maine, to make a Geological Survey of the entire State.

Having travelled several times through the State, and knowing how vast was its extent and how difficult would be the undertaking, I hesitated at first, doubtful whether I should be able to accomplish so Herculean a task and do justice to the subject.

Trusting to your aid and indulgence in the accomplishment of this great work, I ventured to accept the overtures of your Board, and forthwith entered upon the survey. Much difficulty was apprehended and felt, from the want of good Geographical Maps on a large scale, for the purpose of recording geological observations, but we have succeeded, as far as our means would permit, by obtaining a large chart of the coast, and correcting its errors as we proceeded, so that we have approximated, as closely as circumstances would allow, the actual state of things in Nature.

The gentlemen appointed as assistant Geologists were Dr. T. Purrington of Brunswick, on the part of Maine, and James T. Hodge for Massachusetts.

Mr. F. Graeter was engaged as draftsman.

I am happy to say that these gentlemen performed faithfully and diligently the duties assigned them, and entered upon their tasks with alacrity and zeal.

Our warm thanks are due to Captain Uriah Coolidge, and to the officers and crew of the Eastport Cutter Crawford, for their kind and spirited exertions in our behalf, aiding freely in the most laborious work, while we were in their company, and offering us every facility for the exploration ot the coast.

Wherever we went in the State, the citizens of Maine appeared to feel a personal interest in forwarding our objects. To particularize those who have thus assisted in the survey, and aided us by their kindness, would require too much time, and we beg leave to tender here our acknowledgements to all.

The State of Maine is one of the most interesting sections of our country, and presents a great diversity of geological facts, which are important in the advancement of the arts and sciences. No other State in the Union has such an extensive and varied rocky coast, indented by thousands of arms of the sea, and estuaries of great rivers. Although it is dangerous of approach to those ignorant of its formation, it offers a vast number of safe and beautiful harbors to those familiar with its topography. The inlets and bays, which are formed by its lofty mural precipices, frequently offer a complete shelter against the fury of the storm, so that the skilful navigator may avail himself of secure anchorage and await the abatement of the gale. Such peculiarities in the topography of the coast, afford great advantages to steam boats, not prepared to withstand the fury of a storm at sea. I have premised the above remarks to show the importance of a correct topographical survey of the sea board of the State, and hope that hereafter, a correct chart may be drawn from actual surveys.

PLAN OF THE SURVEY.

In order to take a comprehensive view of the Geology of the State, it became necessary to lay down some regular plan, according to which the observations should be distinctly noted. For this purpose, I thought it would be most expedient, first to examine the coast, where the action of the sea had laid bare the rocks so that their structure and superposition could be clearly ascertained.

The frequent and deep indentations of the coast offered us many advantages, by exhibiting natural sections of the rocks, of which the promontories are formed. Knowing from former observations, that the general direction of strata in Maine is N. E. and S. W. I found that the coast section would give me the extent of most of the strata in a longitudinal direction, while the indentations, bays and mouths of rivers gave those of a transverse order. I was anxious to divide the State as far as practicable, into squares, so as to intersect every rock on which it is based, and explore the different beds and veins of metallic ores as they presented themselves to view. This plan has been followed and advantage was taken of the river courses to obtain the most perfect views of the strata.

The first great object of the survey was to ascertain the geological boundaries of the State. This was effected as follows—The sea-board from Lubec to Thomaston was carefully examined, so as to determine the nature and position of the different rocks. Then the St. Croix was explored, and the line followed onward to Houlton. From that place we proceeded to the St. John river, and pursuing its western bank, we obtained a section of the strata, which cross the public lands, and crop out along the course of that river. At the Grand Falls we took canoes and examined the rocks and soils to the Madawaska river. By following this plan, it will be seen on inspecting the map, that we have made a reconnoissance of two sides of a very large square, forming

the eastern, and northern boundaries of the State. Besides this we have made a great number of minute surveys of important localities.

Last year I explored a portion of the State from Portland to Lubec, and those observations are now added to the map, as are also my researches up the Penobscot to Williamsburg.

It will be seen at a glance, that a great extent of country has been traversed by us, while on the survey, and the observations collected will serve as a key to the Geology of the State. In exploring so wide an extent of country, it is probable that some omissions must have taken place, and errors may be found in the boundaries of the rock formations. These must be added, and corrected in subsequent researches, as we proceed with the work.

In addition to my geological duties, I thought it might be interesting to ascertain, by barometrical measurement, the elevation of some of the remarkable mountains, and have succeeded in two instances, which will be found recorded in the Report.

TOPOGRAPHICAL GEOLOGY.

UNDER this head I shall describe the different localities which were examined, nearly in the order in which they were explored. This portion of my Report will serve as a guide to those persons, who may be desirous of visiting the localities in question, either for the purpose of testing the accuracy of our results, or for obtaining a knowledge of the subject of which I shall treat.

FIRST SECTION.

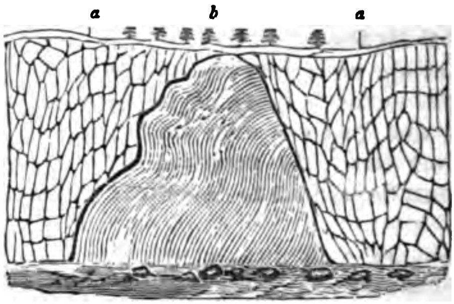
It became an interesting question, whether there occurred, in the State, any of the series of rocks which belong to the regular Coal Measures, as exhibited in other parts of the world. Having, on a previous occasion, ascertained that rocks of this order were found in Nova-Scotia and New-Brunswick, and that the same kind of rocks occurred on the St. Croix River, the President of the Board of Internal Improvements desired me to devote my attention first to this district.

In compliance with these instructions, our course was directed to that portion of the State which forms the boundary between Maine and New-Brunswick; and both sides of the St. Croix River were carefully explored.

Moose Island, on which the town of Eastport is built, was first examined, with a view of ascertaining the relations of its rocky mass to the surrounding strata. This island consists entirely of greenstone trap-rocks, of a compact texture, but presenting, in many places, an irregular, columnar structure. It is frequently amygdaloidal, having rounded and oval-shaped cavities, which are generally filled with infiltrated minerals, such as chlorite, epidote, calcareous spar and iron pyrites. This rock rests upon red porphyry, which is also charged with abundant crystals of pyrites of a cubic form. The trap rocks are also observed to rest upon strata of flinty slate, which evidently owes its induration to the action of

the superincumbent rock. Of this, however, we shall treat more fully hereafter.

At Broad Cove on the southern part of Moose Island we observed a large mass of stratified slate, impregnated with a small proportion of carbonate of lime, included between high walls of trap-rocks, and exhibiting remarkable contortions in its strata, as if they had been broken up and elevated by subterranean power. This slate has a general inclination to the S. W.; but owing to the confusion in its strata, the angle of the dip could not be estimated. This slate is filled with abundant impressions of marine shells, resembling the genera mytilus, tellina and lingula; but no remains of the substance of the shells could be found, it having been entirely absorbed by the rock. The following diagram exhibits the situation of the rocks at Broad Cove. The precipice is 60 feet above the water's edge.



a a Greenstone trap-rocks.
b Contorted strata of slate containing impressions of marine shells.

A few narrow veins of the sulphurets of lead and copper, and arsenical iron are found in the trap-rocks on Moose Island, but they are too insignificant to be of commercial value. Although the greenstone trap-rock of Eastport is extremely hard and slow of disintegration, it forms, when decomposed, an excellent soil, which covers the rocks with a thin, but fertile stratum of a dark brown loam, in which the usual culinary vegetables grow luxuriantly. This soil is remarkable for the excellent potatoes which it produces and which vie with those of Nova-Scotia. Where this soil contains any sensible proportion of sulphate of iron or copperas, it

may be amended by the use of lime, which will change the deleterious salt into a valuable stimulant to vegetation.

From Eastport we made an excursion by land to Perry, tracing the extent of the rocks as we travelled. At the northwestern extremity of the island, near the bridge, the trap-rocks are divided into thin, tabular sheets, resembling, in some measure, a stratified rock. On the road to Perry, we observed an abundance of potter's clay, such as is used for making bricks. Eight miles N. N. E. from Eastport, we came to the outcropping edges of the new red sandstone, the strata of which run E. S. E., and W. N. W. and dip 20° N. This formation we explored carefully, along the St. Croix, proceeding in the custom house boat, up the river, to Calais, examining the strata on either side, ascending and descending.

The whole coast, from Indian Town to Robbinston, consists of strata of red sandstone, intersected by numerous dykes or veins of greenstone trap, which exhibit, in every locality, its remarkable action on the rock, which it intersects, converting portions of the sandstone into a breccia or trap tuff, forming amygdaloid, and converting the sandstone, frequently, into complete scoriæ. In the amygdaloid are found numerous nodules of calcareous spar, coated, on their external surface, with a layer of bright green chlorite, geodes of agate, containing crystals of amethyste quartz, apophyllite, analcime and various other infiltrated minerals, specimens of which are deposited in the collection made for the State.

Few rocks form a more regular and graceful outline than the sandstone. The overhanging precipitous cliffs which skirt the St. Croix, on either side, present the observer with peculiarly picturesque scenery, illustrations of which will be found in the atlas accompanying the report. The precipices at Lewis Cove, in Perry, rise to the height of 50 or 60 feet, and present a perfectly mural escarpment; while the lower surface of the rock is worn away by the continual action of the tide waters, so as to undermine the cliffs, and cause a rapid degradation of the coast. The manner in which the sandstone yields to the action of water is curious; the cliffs being worn away, so as to form rounded projecting masses, which give to the rock an appearance of heavy, elephantine architecture. Not unfrequently, large portions of this rock

are detached from the main land, by the inroads of the sea; and lofty, castellated masses are isolated, and stand like giants in the midst of the waves. One of the most remarkable of these isolated towers is found at Lewis Cove, Perry. It is a single mass of red sandstone thirty-eight feet high, and worn at its base so that it is but eighteen feet in diameter. Its summit, which is 24 feet in diameter, is clothed with verdure, and supports a number of forest trees. This tower has received the appellation of the Pulpit Rock.—[See PLATES.]

Near this place we discovered the charred remains of fossil plants in the fine red sandstone, a little north of Pulpit Rock. These fossils are the remains of fuci or marine plants, and are contained in the solid rock, seven feet above the base of the cliff. We traced the red sandstone along the coast to Liberty Point, where a remarkably coarse breccia, consisting of square and angular masses of red porphyry slate and greenstone trap is found; the blocks of porphyry being not unfrequently from one to two feet in diameter. [See PLATE.] Crossing the channel, we visited St. Andrews and traced the same rock through that town. At Joe's Point, St. Andrews, we discovered another large dyke of trap which traverses and overlies the sandstone at that place. The strata of sandstone here consist of layers of fine and coarse varieties, with beds of grey sandstone alternating with them. The strata run E. N. E. and W. S. W. and dip 17° E. S. E. Following our course up the river, we soon discovered that the sandstone does not continue above Liberty Point in Robbinston; but a rock consisting of a bright red felspar, with a few particles of hornblende occurs, forming a beautiful variety of sienite, which appears to be of the same geological age as the red porphyry before described. This rock extends to an eminence called the Devil's Head, and forms the entire mass of Neutral Island in the middle of the river. The red sienite of which we have spoken, is traversed by numerous fissures, so that it is difficult to obtain large blocks; otherwise, it would form a beautiful stone for architectural purposes. It may however be wrought into elegant articles of ornament, and will take a fine and durable polish. At Calais we found a coarse variety of hornblende rock, consisting of large irregular crystals, and masses of horn-

blende and felspar. Near Bog Brook we examined a quarry of beautiful granite which, is extensively quarried by Mr. Whidden of Calais. This granite consists of a delicate, rose-colored felspar, black mica and quartz, united with great regularity, and presenting a very smooth surface when broken. It splits into large and perfect blocks, admirably adapted for architecture. Masses have here been obtained which would weigh sixty tons. There can be no doubt that this locality is of great value, since it is situated favorably, it being only half a mile from the river, and on an elevated spot, so that the blocks can be easily transported. Having learned that granite and hornblende rock continued for some distance above Calais, we did not think it advisable to proceed farther up the river at this time, and deferred, until a subsequent visit, the exploration of this section. Returning, we visited all the most important localities of red sandstone before noticed, and laid down on the map its extent, and the situation of all the important dykes and beds which it contains.

From the observations which we have been able to make, it will appear, that the sandstone here described is a continuation of that, which exists in New-Brunswick, and in which the bituminous coal of the Grand Lake is probably contained. It will however be impossible for me to speak positively on this subject, until I have visited that district; for no survey of that region has ever been made. It is, however, an undoubted fact, that the sandstone in question is identical with the red sandstone of Nova-Scotia which contains gypsum, salt springs and coal. In a subsequent excursion around Lubec Bay, we found a salt spring, which issues from the soil, near the junction of this sandstone with the argillaceous limestone rock, above the Lubec lead mines. The new red sandstone rests directly on the transition limestone at Pembroke. It occurs also at Red Head, Nutter's Point, where it is of an exceedingly fine texture, and will serve perfectly, for the manufacture of hones and fine grindstones for delicate tools.

If coal really occurs in this sandstone, it should be found between the village of Pembroke and the St. Croix River. In the present state of our knowledge of the country, it is impossible to say more respecting the occurrence of coal in

this section. It not unfrequently happens that some members of the coal series are wanting, which may possibly be the case here. It is however worthy of exploration; and by boring through this rock in a few places, the question may be settled, at little expense, to those who may enter on the task.

Should no such operations be carried on before the next year, I hope to be allowed to extend my researches to the known coal regions of New-Brunswick, on the Grand Lake, when more light may be obtained on this important subject. The numerous irregularities to which our coal measures are subject, render it difficult, if not impossible, to trace them, without the aid of immediate comparisons of one section with another. No geological observations would imply, that the red sand stone in question should not contain coal; for if it should be found equivalent to the new red sandstone formation of Europe, it will belong to the upper coal series. The occurrence of a salt spring at its junction with the limestone appears to favor this supposition.

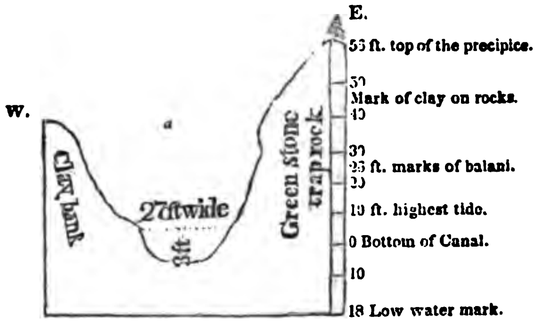
SECTION SECOND.

Our next object was to examine the whole circuit of Lubec Bay, in order to ascertain the nature, order and extent, of the various rocks, which there exist. Although this bay has one of the most irregular and complicated coasts that can be found in the whole State, and is said to have more than 150 miles of sea coast, by the aid of Capt. Coolidge and Solomon Thayer, Esq., who were well acquainted with all its indentations, we were able to accomplish the survey, with regularity, in a rapid manner. The cutter took us swiftly from one station to another, and the activity of the boat's crew enabled us to visit all the important localities, which were carefully examined, and specimens of every rock and mineral were secured. During my excursions in the summer of 1835, I had an opportunity of learning what questions were here to be decided, and consequently was enabled to economize time, by proceeding at once to the localities. At the Lubec plaster mills there is an interesting deposit of recent shells, which were discovered in excavating a canal from South to Rummeries' Bay. This canal was made for the purpose of furnishing tide power, to move the water wheels of the mills,

used in cracking and grinding gypsum. In removing the earth, consisting of alternating layers of clay and sand, from this excavation, marine shells were disclosed in regular layers imbedded in the clay. The earth was dug out from between high rocks to the depth of 30 feet. The bottom of the canal is 18 feet above low water mark, and is 70 rods long and 27 feet wide. Its direction is from N. W. to S. E. The solid rocks which form the banks of this canal, are of greenstone trap, of a very compact kind. Their surfaces, however, have been worn by the former action of the sea, which, anciently, must have dashed against their sides. Now they are far removed from the reach of the waves, and the circumstances under which they were formerly exposed, remain to be accounted for. We measured the height of the rocks on the N. E. side of the canal, and found them to attain an elevation of 56 feet above its bottom. On the sides of these rocks, at an elevation of 36 feet above the bottom of the canal, and 26 feet above high-water mark, occur the remains of barnacles attached to the rock. The clay and mud, which was dug from the place, was filled with myriads of shells belonging to recent species, such as now live on the neighboring sea coast. All the different species, which we collected at this place, have been distinctly recognized by conchologists. They are the pecten pælii, saxicava distorta, mya mercenaria, mytilus edulis, venus,—modiola papuana.

The sea now never attains this elevation ; yet it is evident from the position in which these shells are found, and the attachment of barnacles to the rocks in place, that the sea once stood over the very spot, where these marine relics are deposited. Has the level of the sea become depressed, or have the rocks been elevated ? To answer these questions I would observe, that it would be difficult, if not impossible, to account for a subsidence of the waters here, without a general change of level in the ocean ; and this is not proved to have taken place. We cannot suppose a partial subsidence of the waters ; for the bay communicates freely with the ocean, and the level would be invariably maintained. The concurrent testimony of all geological observers is in favor of a change of level in the land, by elevation ; and such a change appears to have taken place here, within the recent *Zoological period.*

The following diagram shews the present condition of this canal.



Canal Lubec Plaster Mills.

a This whole ravine was filled with mud and marine shells.

The plaster mills which are supplied by this canal, are the only works of the kind in our country. They were erected in 1834, and have ever since been in active, and profitable operation. They are provided with eight submerged, reacting water wheels, which move with great rapidity, and carry all the machinery, used for cracking and grinding the plaster. Each cracker supplies two pair of mill stones; and the gypsum, being carried by an inclined railway, to the upper room, is sent down again through the mill in a fine powder, which is received directly into casks, and packed for sale. In 1835, these mills ground 10,000 tons; 1836, 12,000. They are, however, capable of furnishing 20,000 tons per annum. The crude gypsum costs $1 87½ per ton, at the mills; and when ground sells for $5 per ton. There are, besides the grinding mills, several furnaces for calcining the plaster, so as to form stucco, and employ five large iron kettles, in which the ground plaster is heated, in order to drive off its water, so as to convert it into that substance. The present year, 15,000 tierces of gypsum will be converted into stucco. The crude gypsum is furnished by supplies from Nova Scotia, and New Brunswick. We were favored with the above particulars through the politeness of Mr. Fowler, superintendent of the works. I have inserted them here, on account of their statistical value.

From the plaster mills we went to Rogers' Island, where the *trap rocks* are seen cutting through the argillaceous lime-*stone,* and resting, in mass, on its strata. In the immediate

vicinity, the limestone is filled with numerous veins of calcareous spar. The stratified rock runs W. by N. and E. by S. and dips 32° N. by E. This Island is precipitous, its sides rising like a wall, from 50 to 60 feet, vertically. On its S. W. side may be seen strata of the limestone, distorted and broken up by the intrusion of the trap rocks.

Passing through the thoroughfare, we examined the strata of slaty limestone, found on the farm of Col. Trescott and at Lawrence's mill brook. At both these localities, we found an abundance of fossil shell impressions in the rocks. Such as are represented in Plates I., II., III. They appear to belong to the genera anomia, terebratula, lingula, mytilus and telina.

At Comstock's Point we examined the limestone rocks, which there abound. The rock is the argillo ferruginous limestone, and is of a dark blue color. It contains many nodules, of an oval form, which are highly calcareous. The strata run N. N. E. and S. S. W., and dip 22° S. S. E. This rock is intersected by numerous dykes of trap rocks, and contains veins of white, yellow, and rose colored calcareous spar, which are found in the vicinity of the dykes. This limestone has been singularly broken up by the trap rocks, which have run into it in perpendicular and lateral veins. Remote from the dykes, impressions of fossil shells, like those formerly noticed, are discovered. Lime was formerly burnt at this place by its present proprietor, Mr. Taft Comstock, who informs me that it was of good quality. Between Bassett's Creek and Straight Bay it has been estimated that there are upwards of 2,000 acres of limestone, of similar quality.

From the composition of the limestones found in this vicinity, I should think that hydraulic cement might be made from the argillaceous varieties. I believe, however, the attempt has never been made to test the propriety of such operations.

At Gove's Point, near the extremity of Seward's Neck, the trap rocks are observed to overlie red porphyry, and a breccia composed of fragments of porphyry and greenstone trap. On the western side of this neck of land, two miles from Gove's Point, numerous veins of micaceous specular iron are found, included in the porphyry. They are seldom more than eight inches wide, and consequently are not of commercial value. The porphyry at this place is columnar,

and forms high precipices, attaining an elevation from 40 to 70 feet above the sea, presenting a hard and rugged outline.

Hog Island consists of slate rocks, and brecciated porphyry, composed of angular pieces of porphyry and greenstone. A narrow vein of sulphuret of lead occurs at this place near the waters edge. It is in a vein of quartz, one foot wide, which is too hard to be advantageously wrought for the lead.

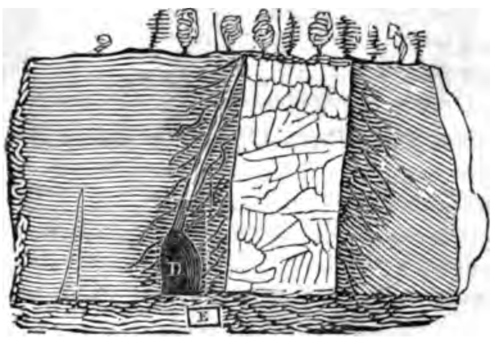
Leaving this Island, we proceeded to the Ramsdell farm, belonging to Mr. Taft Comstock. Here we observe the junction of the trap rocks with argillaceous and calciferous slates, which are overlaid by heavy masses of the trap, which has been forced through them, and spread out on their upper surface. The two rocks are blended at the point of contact, and a breccia formed of their fragments. The slate is changed into a very compact kind of novaculite.

Proceeding towards the Lubec lead mines, we discovered an abundance of fossil shells, in the blue limestone. The strata run N. and S. and dip to the East 38°. This limestone has numerous veins of calcareous spar, which abound near, and in contact with, the trap dykes that intersect its strata. A small vein of galena, a few inches wide, occurs at this place.

Arrived at the lead mines, we examined their situation, beginning at the North and proceeding Southerly. These mines are situated on the estate of Mr. John Ramsdell, on the western side of South Bay, and four miles west from Lubec. They are contained in an argillaceous limestone, like that formerly noticed, and the veins are found at the points where that rock has been traversed by dykes of trap. The strata of limestone run N. W. and S. E. and dip S. W. 35°. These veins of lead ore were discovered in 1832, and have been wrought during the summer months of two years. The northern vein runs in an E. and W. direction, and dips South 80°. It is mixed with yellow sulphuret of zinc, and calcareous spar, the whole vein being three feet wide. In exploring this vein, a drift or gallery was excavated, in a westerly direction, following the vein in its course. This drift we measured, and found that it extended into the rock, to the distance of 60 feet. A perpendicular shaft or well was sunk, in the middle of the gallery, to the depth of 16 feet, and

another at the mouth of the mine 12 feet deep. These pits were sunk for the purpose of attacking the vein at a lower level. They were both filled with water, so that we could not enter them. It was observed by the miners, that the vein widened as it descended. But this we could not determine at this mine, but such is certainly the case with a small vein of the same ore in the cliff by its side, which is six inches wide at the bottom, while it is nipped out, at the height of six feet, shewing that the vein must have been injected from below. The following diagram shews the situation of this vein.

a *b* *d* *c* *b* *a*



e

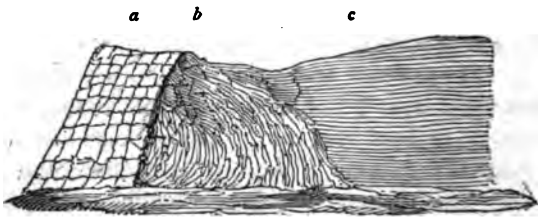
a a Strata of blue slaty limestone.
b b Broken and distorted strata filled with calcareous spar.
c Trap dyke.
d Vein of galena.
e Narrow vein of galena, nipped out at the top.
D Drift.
E Shaft.

Seventy yards south from this mine, is found another vein of galena, contained in a blue limestone, at the junction of that rock with the greenstone trap. This vein is two and a half feet wide, and is contained in a gangue of quartz and compact felspar, and is known to the miners by the name of hard vein. It intersects an abrupt precipice of limestone, which is nearly 100 feet high, and is seen on the face of the cliff. A drift has been excavated into this rock, following the vein in a westerly direction, to the distance of 155 feet. The miners found, in their operations, that this vein had been thrown out to the south by a shift or fault, and proceeding in that direction, it was recovered and pursued. The vein

mytilus, &c. On the shore of the creek, at this place, is found a saline spring, which breaks out through a bed of clay. Its outlet was formerly above high water mark, but has been displaced by a slide in the bank, so that it is now accessible only at half tide. As it was covered with the sea, when we visited the spot, we engaged one of the inhabitants to obtain a quantity of the water when the tide subsided; and were shortly after furnished with a half barrel of it, which I have since analyzed for the purpose of determining its nature and value. This spring, according to Mr. Solomon Thayer, furnishes more than four hogsheads of water per hour, and near it is found another spring charged with carbonate of iron.

We proceeded to examine the rocks at Nutter's Cove in the town of Perry, where there is a remarkable disturbance exhibited in the strata of argillaceous limestone, at the junction with the trap-rocks. The appearance of the strata shews evidently, that they have been broken up, by the upheaving of the neighboring trap dyke.

The following diagram illustrates this section.



Nutter's Cove, Perry, (Maine.)

a Trap dyke.
b Calcareous spar.
c Contorted strata of limestone.

The dip of the limestone remote from the dyke, is to the N. W., and contains abundant casts of fossil shells, such as have been described. Where the trap cuts through this rock the strata are turned up and curiously contorted; while abundant narrow veins of calcareous spar traverse it, near its junction with the upheaved rock. The greenstone trap at this place, appears to belong to the same dyke which traverses the red sandstone at Loring's cove, and contains many of the same kinds of minerals, which we found there.

The direction of the dyke serves also to identify it with the one examined at that place. A breccia, composed of angular and rounded pieces of porphyry and trap, is found at this place.

On Nutter's point a very fine and compact variety of red sandstone occurs, suitable for hones and whetstones for fine tools, and is used for this purpose, it being preferred to the best Turkey oil-stone. This sandstone is curiously altered by the trap rocks, in contact with it, to which it evidently owes its compact texture and columnar structure. It is extremely hard and difficult to break, and where it has a columnar structure, the masses separate into small square fragments an inch or two in diameter. In some places, where it is more compact, larger pieces can be obtained.

We next examined a tract of land, situated in the town of Pembroke, belonging to Mr. Hardon Clarke. The rocks on this estate consist of the argillaceous limestone, filled with innumerable impressions and casts of fossil shells. Near the shore, we obtained a great variety of these fossils, which are very important, in determining the relative age of the rocks, in which they are found. Among those which we have recognized, are three distinct species of an extinct crustaceous animal called the trilobite, two of which belong to the genus asaphus, and the other to the calymene. It is highly probable that all these species will prove to be new, as they differ from any which I have seen figured. [See PLATES.]

Several species of the genera terebratula, productus mytilus, tellina, and venus, were obtained, as were also casts of encrinites and orthoceratites. [See PLATES, I, II, III.]

This rock has, like many others which I have mentioned, been broken through by numerous trap dykes, four of which were measured. Veins of calcareous spar occur near the point of contact of the two rocks.

Hersey's Head, situated near this place, consists of the same kind of limestone I have just noticed, and is overlaid by a powerful mass of trap-rocks, which form an overhanging precipice. In this limestone, occur remains of fuci or marine plants. The same rocks are found on the whole extent of the coast from this place nearly to Pembroke village. Near

the foundry, we again discovered a fine red sandstone, which crops out by the road side, and extends some distance. This rock is stratified, and runs N. N. E., and S. S. W., and inclines to the S. S. E. 15°. It is evidently a continuation of the strata which we had formerly observed on the St. Croix. It rests on the blue argillaceous limestone, which we have described, and evidently belongs to a more recent formation than that rock.

During our excursions in Pembroke, we took occasion to visit the iron foundry, which was erected there a few years ago, and carried on its operations for some time, the supplies of iron ore having been obtained from the mines of Nictaure, Nova-Scotia. The speculation did not prove advantageous to the proprietors, and the works have been abandoned, and are now in ruins. A large heap, consisting of perhaps 100 tons of the Nova-Scotia iron ore, now lies neglected in the foundry.

From Pembroke we made an excursion up to the village of Dennysville, following the river, in a boat, to that place, and examining the rocks on either side as we proceeded. Owing to the rapidity of the tides, numerous whirlpools are formed, which are extremely difficult to pass through, and continual danger is experienced, of being overturned by the irregular and tumultuous rushing of the current among the rocks. Although we did not succeed in adding many new and interesting specimens to our geological collection, during the cruise to Dennysville, we learned the nature and extent of the different rocks, which there occur. They consist of a very hard kind of trap-rock, and of clinkstone, a variety of trap containing a very large proportion of compact felspar, and distinguished by its metallic sound, when struck by a hammer, from whence it derives its name. Although this rock is of a black color internally, it becomes white on its exposed surface, so that it may be mistaken at a distance for granite, or for white limestone. Rocks presenting this appearance may be seen in the river and along its banks.

We made several excursions to Deer Island, Campobello, and other islands in the mouth of the bay, where we found the rocks to consist almost entirely of greenstone trap, sometimes including porphyry and slate. Small veins of magnetic

iron ore are found on Deer Island. None that I have seen there are of sufficient magnitude to afford supplies to a blast furnace.

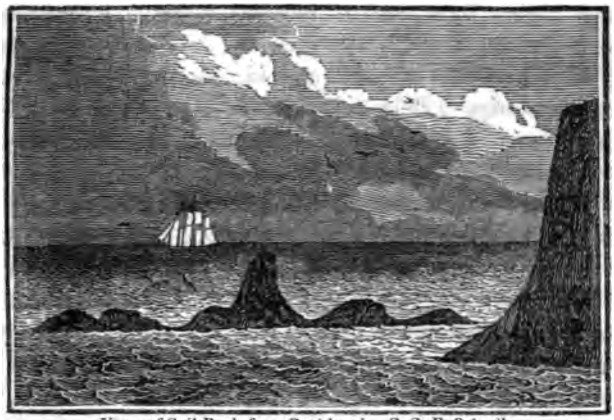
At Clam Cove, on Deer Island, indistinct impressions of fossil shells may be observed in the trap-rocks. These impressions have been evidently taken from the subjacent slaty limestone, with which the trap-rock is blended. Campobello presents lofty overhanging precipices, of irregularly columnar trap-rocks, which, on the eastern side of the island, attain an elevation of nearly 150 feet above the level of the sea. This rock is like that before described, vesicular and amygdaloidal at the base of the cliff, while it is columnar above. In the vicinity of Lubec village, the same kind of rocks are seen resting on slate and limestone, through which they have been elevated. At the narrows, it is this rock, concealed beneath the waves, that renders navigation there so dangerous to those, who are not perfectly familiar with the situations of the ledges. It is an exciting scene to view the daring intrepidity of the Quoddy fishermen, as they rush on the tide through the narrows, guiding their frail vessels fearlessly amid dangers, which their foresight enables them to avoid. Even those accustomed to a mariner's life, cannot stand upon the rocks at Lubec, and look upon the swiftly passing fleets of small vessels that throng the narrows, appearing at the entrance in one moment, and gone out of sight the next, without feeling that the whole scene is one of enchantment, to which the surrounding crags and green islands, add the charm of their beauty.

The object of our next excursion was to make an examination of West Quoddy Head, and the rocks between that place and Lubec. They were found to consist of greenstone trap extending entirely to Quoddy Head, which is the most elevated precipice, of this rock, found on the coast. Like many other localities before described, the place exhibits the intrusion of powerful dykes of trap through slate and limestone strata, which it overlies in mass, effecting changes like those already noticed in the description of numerous similar localities. A large mass of pyritiferous slate, or slate charged with sulphuret of iron, is found near the light-house, in the lower part of the cliff. Where this rock has been

exposed to the action of air and water, the sulphuret of iron has undergone chemical decomposition; the sulphates of iron, alumina, lime and soda are produced, forming an efflorescence on the surface of the rock. They are also coated with red oxide of iron, which gives a bright red color to the surface of the rock, so that it will readily be distinguished. [See PLATE.] Several narrow veins of galena, sulphuret of zinc, and arsenical iron, occur in the argillaceous limestone at this place, but they are not of sufficient magnitude to warrant mining operations. The strata of slate are turned up in some parts of the precipice, so as to become nearly vertical. Few localities in Maine have presented us with so distinctly marked columnar trap-rocks, as are found here. They are mostly three and four sided blocks, which are piled in lofty columns to the top of the precipice, while they incline a few degrees to the N. W. appearing as if ready to fall into the sea. These blocks are detached in great numbers, by the heaving action of frost, and fall around the base of the precipice, where they are gradually rounded by the surf and attrition. We measured the height of the precipice near the light house, and found it to be 105 feet perpendicular above the level of the sea. The rocks more inland rise gradually until they attain an elevation of nearly 200 feet above the sea level. There is perhaps no other locality on the whole sea coast of the United States, where the mind is more powerfully affected by the sublimity of rock scenery, than at this easternmost extremity of our country. Here are lofty precipices, like dark overhanging battlements, raised high in air, amid the surf, bidding defiance to the storm. Nor does the changeful state of the atmosphere, with its ever varying tint, from the bright morning or roseat sunset, to its thick mantling fogs, detract any thing from the beauty of the scene. There is sublimity even in the sound of the fog bell, as its warning note echoes among the dark caverns and rocky crags, giving notice to the unwary mariner that he sails amid dangers. In the space of a single day, we experienced all the vicissitudes to which I have above alluded; and even the pelting of the rain did not damp our admiration of the scenery. To view advantageously this spot, let the traveller visit its rocky cliffs in a boat, and clamber awhile over them at his leisure,

and I am sure, if he have any love for natural scenery, he will be delighted with his excursion.

I may also be allowed to make a few remarks on the Light House and fog alarm at this place, and of the dangers to which vessels are exposed on entering this passage. Immediately in the vicinity of Quoddy Head, and almost beneath its very brow, stands a dangerous, half sunken ledge, called, from its fancied resemblance to a ship, the Sail Rock. This rock is one of exceeding danger to the unwary navigator, and not unfrequently proves fatal to a passing ship.



View of Sail Rock from Boat bearing S. S. E. 3-4 mile.

When a dense fog sets in, as happens very frequently, the navigator loses his way, having no land mark by which to steer, and is suddenly dashed upon this rock;—his ship bilges, rolls over and sinks, or is dashed to pieces by the surf, as it were, in a moment, before any assistance can reach him. To obviate this danger, a light house was erected, which consists of a lofty tower, 90 feet high, and a fog bell was placed near it, to give alarm when the light could not be seen. When any vessel approaches these rocks, she fires a gun, and it is immediately answered by the bell, which is kept ringing until she has passed the danger. Mr. Godfrey, the light house keeper, informs me, that he is required to ring the bell about one hundred days in the year, and especially during the months of June, July and August. Many contrivances have been made to ring the bell by clock work

machinery, but thus far, all efforts of the kind have been unavailing; for the power required to wind up the heavy weights which move the machinery, was found to be fully equal to the task of ringing the bell by hand; and the clock work had not sufficient power to give forth its full tone. Unfortunately, it also happens, that the note of the bell accords so perfectly with the ocean's roar, that in stormy weather it cannot be distinguished from it, even at the point of the greatest danger, the Sail Rock. Some new contrivance must then be had recourse to, in order to prevent disasters. An ingenious friend has suggested, that a loud whistle blown by means of bellows, worked by machinery or horse power, might better answer the purpose of an alarm, since the shrill tone of such an instrument would reach far beyond that of any bell, and the power required to keep it in action would be much less. In locomotive steam engines, a steam whistle is used, to give warning to the approaching train of cars, and is said admirably to fulfil its functions. It has also been suggested that a sharp toned bell might be placed on a tower or iron frame work, erected upon the Sail Rock itself, and the machinery kept in motion, by reciprocating rack-work, moved by the rise and fall of the tide, a strong raft being moored close to it, by heavy anchors and chains for the purpose.

Returning from this digression, which I trust will be pardoned on account of the importance of the subject, we will proceed to examine the neck of land, which connects this high promontory with the main land of Lubec. Here there is evidence, that this isthmus is of but comparatively recent formation, and that West Quoddy Head was formerly insulated by the sea. The whole neck which is called the carrying place, consists of a bed of clay and sand, appearing as if deposited by water. Its upper surface is covered with a bed of luxuriant growing peat, to the depth of 15 feet, while the bottom, consisting of blue marly clay, is nearly on a line with the sea, the whole plain being but 17 feet above high water. The peat at this place is interesting, as it may be seen how it forms from sphagneous plants, various mosses and the remains of a few low scattering bushes. It is to the mosses that the peat owes its origin, and this humid

head, and a shout of merriment announces that he has done homage to the grave personage in question. Many superstitions are attached to the history of the Friar, his prognostications of the state of the weather being among the most useful of his attributed accomplishments. Although the legends of the Old Friar would form a good subject for a story, which might occupy the pen of the novelist, we cannot digress to relate his history, and will only remark that he is certainly an emissary of Pluto, and made his appearance amid the outbursting of subterranean fire!

SECTION THIRD.

This section comprises the Eastern Atlantic coast of the State, from West Quoddy Head to Thomaston, including the various bays and indentations which were explored. Although this line of sea coast, from one extreme to the other, in a straight line, is but 180 miles in length, yet, owing to its irregularities, if the curvatures of the coast are followed, the extent will not fall short of 700 miles, excluding the rivers and circumference of islands from the estimate. In order to take a rapid and comprehensive view of this section, we availed ourselves of the use of the Revenue Cutter Crawford; and running down close to the land as possible, made frequent excursions in the boat, while the cutter stood off and on, or came to anchor, according to the time required at each place, and the nature of the harbors at command. Few localities of interest occur, for a considerable distance along the coast, the rocks consisting of enormous cliffs of greenstone trap, intersecting and overlaying argillaceous and calciferous slate, which is generally, under such circumstances, changed in part into chert, imperfect hornstone, or lydian stone; while those portions less affected by the trap, are split into rhomboidal fragments, and charged with sulphuret of iron. Lawrence's Cove, Broad Cove, and Haycock's Harbor, present us with good illustrations of these changes in the rocky strata. At the latter place there is a large mass of regularly stratified roofing slate, which has been broken through by a number of large dykes of trap; and most of the changes above noted may there be seen. Some masses of this slate are free from pyrites, and

easily into slates a foot and a half square, but they are not so perfect as those I shall have occasion to describe hereafter. They may, however, become useful to the inhabitants of this section of the country, on account of their vicinity, and they will answer well for roofing. That variety of the slate charged with pyrites, will answer perfectly for the manufacture of copperas and alum. Haycock's Harbor offers a favorable situation for the use of tide power; the mouth of the harbor being narrow, so that a dam could be easily thrown across it, while there is a small river which contributes to its supply. Near this place, at Bailey's Mistake, are found a few narrow veins of magnetic iron ore. At Little River may be seen another example of the intrusion of trap-rocks into calciferous slate, which has been changed at point of contact, into a very hard variety of greyish white chert. The soil on the promontory, forming this harbor, bears a luxuriant growth of spruce trees, which, by their perennial verdure, add to the beauty of the landscape.

From Little River, we proceeded in a boat, to explore Little Machias Bay. Here the trap-rocks may be again observed, forming bold headlands at the mouth of the harbor, on either side. At the head of this bay occurs a large quantity of potter's clay, which is used for the manufacture of bricks. Few interesting minerals occur at this place, and the geological appearances are such as I have previously described, as occurring in similar rocky associations. The promontory of land forming the south east side of this harbor, at a place called Grant's Point, is found a large vein of milk quartz, of pure whiteness, suitable for the manufacture of the best kinds of glass. This bed is very large, and is said to be upwards of a quarter of a mile in width; but owing to the covering of soil, we could not trace its exact limits. It is evidently of sufficient extent to warrant the erection of a glass furnace on the spot, the situation being favorable, and suitable wood abundant.

Cross Island, situated one mile south east of this promontory, is remarkable for its lofty mural precipices, which consist entirely of greenstone trap, which, on the south western side, attain an elevation of 166 feet above the level of sea, forming a steep and craggy escarpment. On the

spot exhibits their growth in full luxuriance, while their lower portions, dead and decayed, form well characterized peat. Owing to the prevalence of fogs, and the spongy state of the peat at this place, it cannot be advantageously dried by the sun, but it may be deprived of nearly the whole of its water, by means of pressure, and then it will form a very valuable fuel. This peat possesses a great advantage in favor of this process, it being so little decomposed, that but a small proportion would be lost, in a liquid state, during the operation. In Germany, peat is dried in kilns, heated with the small fragments, and refuse parts of the same substance. When it is remembered, that according to the analysis of the late Sir Humphrey Davy, peat contains 60 per cent. of carbon, its use should by no means be discarded; it is a valuable fuel for domestic purposes, and for many manufactories. The above remarks will apply to many other localities in the State, and the time will arrive when wood becoming scarce, our neglected peat bogs will be in requisition.

Returning to Lubec, I had an opportunity of hastily dissecting a large grampus, or black fish, the skeleton of which, we engaged its captor to prepare for the State Museum. It having been unfortunately set adrift, the State has lost the opportunity of securing an adult and perfect representative of one of its marine animals.

During foggy weather the next day, we endeavored to ascertain, by means of the drag, what shell fish and other marine animals, we could find on the bottom of Cobscook Bay, and caught one of the species of Terebratula, a recent species, belonging to the genus we have described as occurring in the solid limestone rocks in a fossil state. Pl. III. Fig. 25 and 26 represent this living species.

Several beautiful star fish were also obtained, two of which are rare, and I had drawings made of them by Mr. Graeter.

We then visited Morton's Cove, where a beautiful limestone is found, reticulated with veins of yellow, white and rose colored calcareous spar. This appearance, which I have so frequently noticed in this report, is an effect produced by the intrusion of greenstone trap-rocks among blue limestone. If this rock were sufficiently compact, it would make a ri[illegible]

marble, equal in beauty to the variety known and prized under the name of Egyptian. Like that marble, it presents rich veins of white, yellow and red. It may happen, that on opening the quarry, compact masses may be obtained, valuable in the arts; at present it is destined for the more humble purpose of making lime. The strata run W. N. W. and S. S. E., and dip to the N. N. E. 80°; while the trap dyke runs E. N. E. and W. S. W., and dips S. S. E. Morton's Cove is frequented by vessels, for the purpose of obtaining a supply of very pure water, that runs in a large spring from the base of the cliff upon the sea shore. It is remarkably cool in summer, and never freezes in winter, being in cold weather constantly enveloped in vapor. I thought it would be interesting to learn its temperature by means of the thermometer. The temperature of the air being 65° F.—that of the water was 44° F. I tested its chemical composition and found only a *trace* of carbonate and sulphate of lime and common salt. It being so nearly pure, it is admirably adapted for the supply of ships bound on a voyage.

Excursions were made upon Seward's Neck, two miles south of Comstock's Point, where some fine examples of the contact of trap-rocks and limestone may be seen. The group of dykes is a quarter of a mile wide, and the most striking changes have been effected by their intrusion into the limestone. The slate rocks are converted into complete scoriæ, and the blue limestone is filled with veins of calcareous spar. Allan's Island, Campobello and Pope's Folly, consist almost entirely of trap-rocks, which form steep rocky shores, having many isolated blocks standing forth in the water, like sentinels placed at the outworks of a castle. Among the remarkable columns, I would notice that on the western side of Campobello, at a place called the Friar's Head. Here a large, black, sombre looking mass of rock, stands at the water's edge, resembling the appearance of a monk with his cowl and mantle. This celebrated rock is called the Old Friar, and it is customary to make all passengers in the ferry boat take off their hats as they pass by him. Various are the devices by which the boatmen effect this object; and the most successful one, is, to ask the traveller "what he has on his hat?" which is generally followed by his uncovering his

the stripes of red, brown, green and blue, which it presents, are the original lines of stratification; and it appears probable, that this jasper originated in the semifusion of regular strata of slate and sandstone. The jasper is overlaid and underlaid by trap-rocks, which, from evidence before presented, you will be satisfied, had an igneous origin; and there is no improbability in the supposition, that such a powerful mass of melted rocks, might have induced the changes in question. There is also another remarkable appearance at this place, demonstrating, that since the induration of the strata, above mentioned, the rocks were a second time disturbed by a similar convulsion; for there may be seen the fragments of the ribbon jasper, broken up into small pieces, and reunited by interfusion with an injected dyke of trap. It is probable that this followed immediately in the train of the first upheaving. Masses of this rock, of large dimensions, may be here obtained, and I have no doubt that it will ultimately be brought into use for ornamental work. Its hardness causes it to be susceptible of a fine and durable polish, but it also renders it costly to work, and our stone cutters are not yet accustomed to the cutting and polishing of stones of so refractory a nature. In Germany or Italy, where the lapidiaries are accustomed to work hard stone, such a quarry as this, would be of inestimable value, and would furnish an abundance of useful and ornamental articles, such as vases, mosaic tables, &c.

We next visited Starboard's Creek, near the little Kennebec river, in Machias, and examined very carefully the situation of the strata of limestone, which there occur. This locality I explored in 1835, while in the employ of a mining company; and our object in the present visit was to review and extend those observations, and at the same time to collect a supply of the interesting and important rocks and minerals for the State Cabinet. Starboard's Creek, is a small but secure bay, having an island of high rocks on the S. E. connected with the main land by a sand-bar, covered at high water. This island forms a shelter on the S. E. The bottom is sandy, and is good anchorage. A small stream, which turns a little saw-mill, empties its waters into this bay. A few inhabitants have here built their dwellings, and subsist on the products of the soil, and by fishing. Our principal object in visiting this place, was to examine the Marble cliff

which exists on the borders of the sea, and extends across the promontory to the little Kennebec. This cliff rises in its highest part 26 feet above the shore, and its foot is bathed by the sea, at high water. The face of the precipice runs N. and S. and extends 612 feet. There are a variety of colored strata, composing this mass, the principal of which, are, red, green, and spotted white marbles, with red sandstone alternating with the strata, while at either extreme the trap appears bursting through the whole series. On the north of this cliff, at the point, occurs a very remarkable breccia, composed of an infinity of fragments of jasper. Flinty slate, hornstone chert, and porphyry, cemented together into an exceedingly hard and compact mass, admirably suited for millstones, as it can be obtained in large masses of great solidity, and its hardness far surpasses the French buhrstones, such as are imported for the use of wheat mills. I should think it might also be used for ornamental work, as specimens were obtained which would be elegant, if polished The marble at this place owes its various colors to an admixture of particles of the intervening strata, and to the presence of petrified fossil shells, which abound in the spotted varieties. From the interstratification of the red sandstone and limestone, it is evident that they belong to the same formation. The whole mass of this strata rests on the argillaceous limestone which is seen at the southeastern point, cropping out below this formation. The shells found in a petrified state, in the Starboard's Creek marble, are mostly univalve shells, among which I have discovered a species of nautilus, and several new and curious species, which have not been described by conchologists. There are found sections resembling the sigaretus and very perfect petrifactions of shells, about the size of a hazel-nut, resembling in form the natica; but I have not been able to ascertain their species. [See PLATE III. FIGS. 14, 15, 19, 20, 21, 22, 23.]

This limestone may be wrought for marble, and it will furnish several varieties, of which the red spotted with white, and the clouded red, are the most beautiful. A white crystalline limestone, found in the lower part of the quarry, may be advantageously burned for lime. It becomes slightly brown, on burning, owing to its containing carbonate of manganese, which is converted by that process into the black

western side of the island, we examined a large vein of calcareous spar, which stands projecting four or five feet above the level of the surrounding rock, and runs in a N. by E. and S. by W. direction, inclining 80° E. by S. It is easy to break specimens from the vein, which naturally divides into large rhomboids three or four inches in diameter. On the western side of this calcareous spar, is found a collateral vein of bright green chlorite, which can be broken out in masses a foot square. Cross Island is visited frequently by the Indian tribes, for the purpose of obtaining the chlorite, of which they make tobacco pipes and other articles, it being soft, so as to yield easily to the knife, while it endures a high temperature without cracking. This mineral can be turned easily, in a lathe, into boxes, candlesticks, and various other forms. It is susceptible of a fine polish, and has a deep leek green oily lustre on its polished surface. It is not found in sufficient abundance to become an article of commerce. Cross Island is covered with a thin but luxuriant soil, and bears a thick forest of spruce trees, and is ornamented with a great variety of wild wood plants. In the autumn, the whole surface of the island is red with mountain cranberries, which furnish an abundant supply to the neighboring inhabitants. Sailing beneath these precipices, in pleasant weather, the scenery is delightful; but in a storm, no spot on the coast appears more terrible—the whole power of the ocean's waves breaking upon the rocks with a tremendous roar, the surf being dashed, in spray, to their very summits.

We made an excursion up the Machias River, where we traced the same kind of rocks I have just described, but which along the river's course, are of a less precipitous character, and are in some places, covered with diluvial sand and rounded stones. This is especially the case on the western side of the river. Near the town of Machias, there is a tract of alluvial soil, forming salt marshes of considerable extent. We visited Buck's Harbor, a secluded bay six miles south from Machias-Port, where we found many interesting geological appearances. There are three islands in the mouth of this harbor—Bear's Island, which consists entirely of trap-rocks; Buck's Harbor, and Yellow-Head Islands. The two latter were carefully examined. Buck's Harbor Island is distinguished as being just in the mouth of the

harbor. It has two high, rounded and barren hills near its centre, which consist of that variety of trap rock called porphyritic clinkstone, consisting chiefly of compact felspar and hornblende, of a dark slate color, with small crystals of lighter colored felspar, scattered through its mass. The base of this island, on its western side, consists of a beautiful rock, composed of crystalline red felspar, with a few scattering and minute crystals of green hornblende. No quartz being present, it cannot be called sienite. This rock exists in a solid mass, forming the lower part of the island, and may be wrought for architectural purposes. It will answer for window casements, in the place of freestone, which it surpasses in hardness and durability. It will take a high polish, and may be used for articles of ornament, such as vases, &c. Blocks may be obtained a foot thick and five feet square. The red felspar rock passes into another variety, in which there is a considerable portion of hornblende, and the felspar is white. It is evident, from the origin and situation of the rocks at this place, that the clinkstone was elevated and burst through the subordinate rocks which it overlies.

Yellow Head Island lies to the eastward of that last described, and consists entirely of yellow compact felspar or porphyry, which forms a steep precipice or bluff, rising 50 feet above the sea. The front of this precipice exhibits an interesting section of the porphyry, traversed by four perfectly distinct dykes of greenstone trap, which cut through the whole mass to its summit. No one, who has seen similar appearances, presented by almost every volcano, can for a moment doubt, that these dykes are thrown up through the porphyry, in a liquid, incandescent state. It also proves incontestibly, that the trap originated *below* the porphyry, and *since* the consolidation of that rock.

Two miles west from Buck's Harbor, we visited a place, to which I gave the name, last year, of Jasper Head, on account of a beautiful variety of ribbon jasper, found there in abundance. The whole promontory consists of this mineral, and the shore is covered with its pebbles, which have been rounded and polished by the sea. Huge blocks, which have fallen from the cliff, lie in confusion upon the beach, and some of them are upwards of 10 feet in length, and four or five feet in thickness. On examining this rock, it will be seen that

oxide, giving the dark color to the lime. The presence of this substance does not in the least injure its quality for mortar, it slacking rapidly and perfectly, and making a very strong and durable cement. Masons who have used this lime declare, that it takes an unusual quantity of sand, and makes excellent mortar. It will not, of course, be used for indoor finishing, nor with stucco, but for every other purpose it is a good article. The following measurements were made along the section of this quarry, in a direction from south to north.

Greenstone trap, 67 feet.

Red marl and sandstone, 44 feet.

Red, white, and spotted marble, 155 feet.

Greenstone trap, mixed with limestone, 100 feet.

Breccia above described, 246 feet.

Near the saw mill, may be seen a curious breccia formed of green marble and jasper, the whole mass having been interfused by the trap-rocks enclosing the strata.

Following the shore around the point to the south, the transition argillaceous limestone, like that at Lubec, was observed, containing an abundance of impressions of fossil shells, resembling the genera lingula, mytilus, saxicava, tellina, and terebratula. This rock is broken up by the trap, and in many places, where the dykes cut through it, is connected with flinty slate, chert and jasper. It is curious also to observe, that the trap itself has taken perfect impressions of the fossils, which occur in the slate and limestone, and narrow veins of calcareous spar abound at the junction of the two rocks. On the western side of the point, half a mile north of its extremity, the strata of limestone and red sandstone, again make their appearance, and from their direction, are evidently a continuation of the strata of Starboard's Creek. But here they are strangely altered, the whole mass having been thrown into great confusion, and so changed, that it is difficult to conceive of its being of the same origin with that before described. The two rocks are here broken up into fragments, and completely interfused, the whole forming a most beautiful green and red spotted marble, while every trace of the fossil shells is obliterated in the breccia, although they occur in the insolated masses, beyond the reach of the greenstone trap. It is difficult to give an

idea of the tumultuous appearance of the strata at this place, without the aid of a sketch. You are, therefore, referred to Plates v. and xvii.

It will be remarked, by those who visit this spot, that the trap sandstone, and limestone, form a complete scoria, or slag, at their point of contact, while the changes induced upon the rocks diminish as they recede from it. It may also be observed, that some large angular masses of limestone may be seen near the top of the cliff, still retaining remains of fossil shells, like those of Starboard's Creek. Lower down, the shells become less distinct, while at the actual point of contact with the trap, every trace of fossils disappears, and the limestone becomes decidedly crystalline, resembling that variety called by ancient geologists, saccharoidal, or primitive limestone. It is also curious to observe that the crystalline masses contain a mineral called laumonite, in small, but well characterized crystals. The rocks, at this place, form a precipice from 30 to 40 feet above the sea level, and the brecciated marble occurs near the base of the cliff, forming a bed of 10 feet in thickness. The strata are much contorted, but generally dip 35° N. and run E. and W. There are few places more interesting to the geologist, than this; for here he may read the history of changes, induced by a rock of igneous origin, upon certain strata, and the characters are too distinct ever to be misunderstood or forgotten. It is probable, also, that this marble can be wrought advantageously; for, although somewhat difficult to quarry and saw into slabs, it is so rich and beautiful, that it ought to command a high price. If wrought into columns, for fire places, the hard points of jasper which it contains, will not produce an unfavorable effect, but will serve to give it variety and richness. It is to be regretted that this marble is not found in extensive beds; but on making farther search inland, to the eastward of this place, perhaps larger quantities may be discovered. Owing to the superstratum of soil, we could not satisfy ourselves on this subject. Starboard's Creek possesses a thin, but good soil, covered with spruce and birch trees, while in summer, roses and wild wood flowers exist in abundance.

We cruised around the shores of the Little Kennebec, and found the new red sandstone at the head of the bay. Along

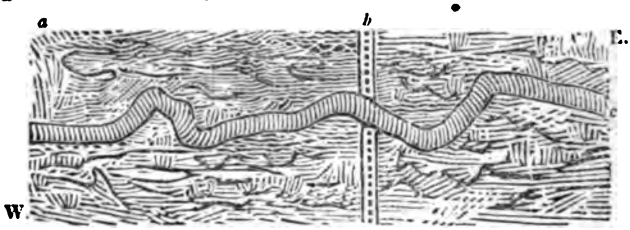
the eastern side of the bay we observed numerous dykes of porphyry, cutting through the argillaceous slate, and lime rock, running in a north and south direction, proving that the porphyry has been injected since the deposition of that rock. We also observed that the porphyry and slate formed a complete breccia, composed of the fragments of the two rocks, where the dykes intersect the strata. On the western side of this bay, the rocks were found to be greenstone trap, the surface being covered with diluvial sand, gravel and numerous rounded boulders of sienite.

Lakeman's Island, in the mouth of the Little Kennebec, contains a little red sandstone on its eastern side, the remainder of the island being composed of trap-rocks.

The next point, where we saw the new red sandstone, was at Great Island, five or six miles south from the point of Maine; it is here so strangely altered, as to be recognized with difficulty. It is overlaid by an enormous mass of trap, and has evidently undergone both heat and pressure, it being as hard as porphyry, and extremely difficult to break. It contains, however, distinct impressions of fossil shells, and even the superincumbent trap has taken perfect casts of them. The precipices on this island, rise to an elevation of 40 or 50 feet above the sea, and the eastern side of the island has a deep cove, in form of a crescent, the shore of which, extending to the distance of two miles, is composed of a beautiful white siliceous sand, valuable in glass making. Such beaches being rare in Maine, especially in the eastern part of the State, and wood being abundant on this island, I would suggest the propriety of using this locality for that purpose. Those who wish to examine the red marl and sandstone beneath the trap, will find this locality interesting.

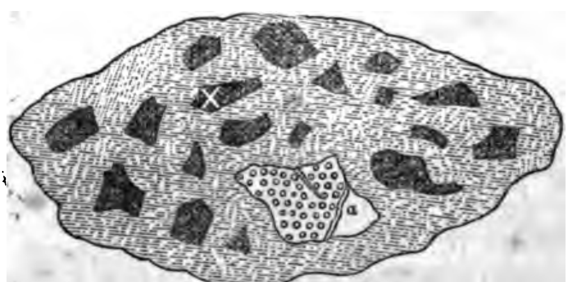
The sand beach is covered with an abundance of recent shell fish, cast up by the sea; and several species, not found elsewhere, abound on this shore. The following species were found here; buccinum undatum, fusus decemcostatus, pecten pælii, fusus antiquus, modiola papuana, mytilus edulis, balanus geniculatus, saxicava distorta, cardium, icelandicum, (C. arcticum Sowerby.) Large and perfect hermit crabs, inhabiting the shells of the fusus decemcostatus and buccinum undatum, are seen scrambling over the sand. at the water's edge.

From Great Island, we ran to Jonesport, and examined the eastern coast of Mispecky Reach, where we found the rocks to consist of sienite, of a dark color, containing lighter colored veins of the same rock. Near the store, at this place, may be seen a curious dyke of trap, running in a zig-zag manner through the sienite, and cutting off one of the light colored veins above mentioned. The following diagram shews the appearance of this dyke.



a Dark sienite rock.
b Vein of white sienite.
c Trap dyke.

The trap is columnar, and the columns strike horizontally from the walls of the sienite. It is evident, from the occurrence of this dyke, that the trap originated below sienite, and is of more recent origin than the vein which it intersects. Proceeding a little farther to the eastward of this place, we found some very remarkable appearances, in the red sienite rocks. They are here observed to form a complete breccia with the trap, the two rocks being mixed together and interfused, while the latter is observed to retain its columnar form. The diagram below shews the appearance of one of these rocks; the dark portions being blocks of trap and amygdaloid, while the light colored portion is sienite.



Surface of a Granite rock at Jonesport, exhibiting fragments of trap rocks included in it.

a Amygdaloidal trap

After exploring the shores of Mispecky Reach, we examined the various islands in the vicinity, some of which are composed of granite, while others are of trap. They are represented in colors upon the geological map which I have prepared.

Examining Cape Split and its shores, to Pleasant River, we found the dark colored sienite rocks, to prevail throughout its whole extent. Although we did not find many interesting rocks and minerals at this place, we were amply repaid for our visit, by the numerous valuable facts, communicated to us by the inhabitants, concerning the modifications which the sea coast has undergone since their recollection.

Leaving Cape Split, we ran over to Mount Desert Island, where we spent some days, examining the rocks in the vicinity of Bass, South West and North East Harbors. On our passage, we observed Petit Menan, where a light house is erected. This island consists entirely of granite rock.

Baker's Island, situate near the coast of Mt. Desert, is the site of a light house. Huge blocks of granite, piled up in large heaps, are seen along the coast.

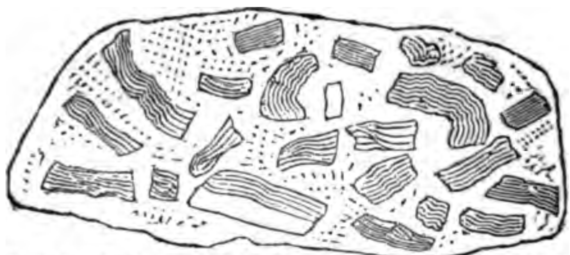
Mt. Desert is one of the most conspicuous islands, on the coast of Maine, and is generally the first descried by mariners, approaching these shores. Its mountains are lofty, rounded and conical eminences, of which there are eleven, conspicuous to the eye from a distance.

Some of these mountains, I doubt not, attain an elevation of nearly 1800 feet above the level of the sea; one, which we measured near North East Harbor, being 1060 feet high, while others were seen from its summit much more elevated. It is said that these mountains, on a clear day, may be distinguished from the distance of 60 miles at sea. The eastern extremity of Mt. Desert, appears to consist entirely of immense mountains of granite and sienite. On the shore, enormous heaps of granite may be seen, piled one upon another, and split by nature into square blocks.

Bennet's Cove, is also a valuable locality of granite, where it may be wrought to advantage, its quality being good, and the quantity inexhaustible.

We examined the rocks at N. E. Harbor, and to the eastward of that place, where they were found to consist of sienite, sometimes of a red color, spotted with black, and

containing numerous fragments of stratified rocks included in them. This appearance, which is curious, and important in geology, shews that the sienite has been thrown up in a melted state, since the deposition and induration of the argillaceous and talcose slates, which are thus included. The sketch below shews the appearance of a portion of this rock.

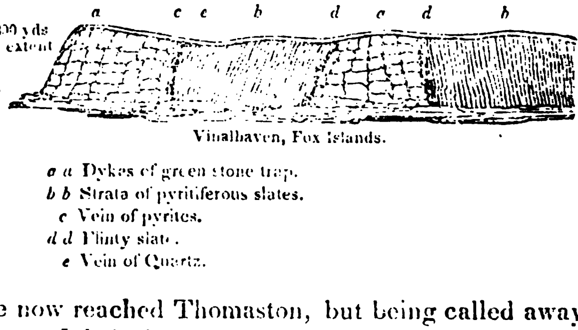


Sienite including fragments of stratified talcose, mica and argillaceous slates

A few veins of magnetic iron ore are found in the red sienite, at N. E. Harbor, but none came under our notice, of sufficient magnitude to warrant mining; there are also a few veins of arsenical iron, and crystals of iron pyrites. A mass of sulphuret of antimony, is said to have been found in this vicinity, but I was unable to find any of that mineral in the rocks. Dykes of trap are here seen bursting through the sienite and granite, below which it evidently originates; their direction is N. E. and S. W., and dip 80° N. W. In this vicinity we found four dykes of this rock in the space of 400 yards; they are from five to fifty feet wide, and are closely cemented by interfusion with the rocks they intersect. At Bass Harbor, veins of magnetic iron ore occur in the trap rocks, which have the appearance of scoriæ where the veins are included. Some of these veins have been wrought, and the ore shipped for Boston. There are several localities on this island, where iron ores have been obtained. Black's Island has furnished a large quantity of hydrate of iron, a very compact variety, containing 40 per cent. of metal. The magnetic iron ore will furnish 70 per cent. Specimens of this ore may be wrought into magnets, by grinding them into proper forms, and fixing on armatures, when they become very powerful.

After ascertaining the nature of the rocks and minerals on this part of the coast, we made an excursion into the interior, for the purpose of measuring the elevation of one of the granite mountains, bearing three miles north from N. E. Harbor. The barometer, at high water mark, stood at 771 millimetres, the temperature of instrument 17°, that of the atmosphere being 15° cent. Having registered these observations, we travelled through the woods, towards the mountain, and at its foot found a small lake, where we again observed the barometer, which stood 768 millimetres, temperature of instrument 21° cent. Arrived on the summit of the mountain, at 12½ P. M., we observed the elevation of the mercury to be, in the barometer, 743$^{mm.}$, temperature of instrument 15°, temperature of air 15° cent. From these elements, we calculate the elevation of the mountain to be 1060 feet above the level of the sea, while the lake is 101 feet above the sea, and the summit of the mountain is 959 feet above the level of the lake. The mountains seen from its summit were counted; they were four on the west, one on the north, one on the east; and some of them rose to a greater elevation than the point upon which the above observations were made. Their general direction is E. and W. Excepting this ridge, the island appeared to be flat, and is watered by a great number of little streams, lakes and inlets. Somes' River or Sound is the most remarkable. This mountain and its neighboring hills are composed entirely of a coarse, granitic aggregate of felspar, quartz, and a few scattering particles of hornblende, the presence of the latter mineral classing the rock under the sienites. Mt. Desert is yet but little known, and will, if explored, furnish many valuable minerals; but owing to the short time we were allowed to spend upon it, we could do no more than glance at its resources. On account of favorable winds, we determined to run to Thomaston, suspending our observations at Mt. Desert for the season, with the intention of renewing them on a future occasion. On our course to Thomaston, we ran down close to Deer Island, where we saw enormous quantities of granite or sienite, which shows itself in huge tabular sheets and blocks upon the shore. Passing the thoroughfare, we observed, with the telescope, that the surface of the rocks, on the northern side of the passage, was covered with the initials of persons names, cut in large letters. We

did not stop to investigate the extent of the rocks on the island, but there is evidently sufficient granite at this place to supply the market for centuries; and the facilities for its transportation are remarkably favorable, as vessels may lie along side of them in safety. The southern side of the Fox Islands is also capable of furnishing an abundant supply of pyritiferous slate, which may be used advantageously in the manufacture of copperas and alum. At this place, in the summer of 1835, I examined an extensive bed of this rock on the estate of Mr. Seth Thomas, where the slate is completely charged with iron pyrites, which spontaneously decomposes and forms copperas. The locality is cut through by a trap dykes, which, doubtless, played a conspicuous part in charging the slate with pyrites. It will be remembered that many other places, mentioned in this report, furnish also an abundance of pyritiferous slate, and most of these localities are valuable for the above mentioned purposes. The following diagram explains the situation of the pyritiferous slate at Vinalhaven.



Vinalhaven, Fox Islands.

a a Dykes of green stone trap.
b b Strata of pyritiferous slates.
c Vein of pyrites.
d d Flinty slate.
e Vein of Quartz.

We now reached Thomaston, but being called away for a few days, I left the survey in charge of Dr. T. Purrington, who was assisted by Mr. Hodge. On my return, I reviewed with these gentlemen the work, which they had accomplished in a satisfactory manner. The results now stated, are abstracted from our mutual observations. I had visited Thomaston several times previously, and had learned many particulars respecting the quarries, and the geology of the place. I was now enabled to acquire more exact and particular information respecting each locality, through the aid of gentlemen resident on the spot. I would mention especially, the valuable services contributed by Dr. Cochran,

Hon. John O'Brien, and Col. Dwight. The first mentioned gentleman, to whom we were under especial obligations, engaged to have a plan of the town drawn, and to collect statistical information respecting the value of the lime business of the place. This he accomplished, in a diligent and careful manner, and his report is appended to the section on the Economical Geology of the State. Mr. O'Brien furnished the Assistant from Maine with valuable information respecting the quarries at the State Prison, and with an estimate of the quantity of marble manufactured in Thomaston. Col. Dwight explained to us his views as regards the extent of the limestone district. To these gentlemen I now beg leave to tender my grateful acknowledgements, both for the services they have rendered in the survey, and for many personal attentions. In order to form a just idea of the nature and extent of the limestone rocks of Thomaston, we examined the strata which surround and contain it, as also those which traverse or cut through its mass. At Owl's Head, we noticed the trap rocks, forming the bold promontory on which the Light House stands, and the shores near the hotel at the steamboat landing. These rocks, at first view, would seem to have little connection with the limestone; but it will be perceived, in the sequel, that they are associated with those which have most assuredly produced chemical changes in the whole district in question.

The immediate strata, which contain the great bed of limestone at Thomaston, are composed of talcose, micaceous and argillaceous slates, charged with a greater or less proportion of graphite or plumbago. These stratified rocks, where they are seen upon the hill, N. W. from the village of East Thomaston, run N. E. and S. W., and dip to the N. W. 55°. On the road to West Thomaston, the same rock is observed to run N. N. E. and S. S. W. and dips to the E. S. E. 60°, and near the marsh it dips to the N. W. by N. and runs N. E. by E. On the hill, the slate is coated with a glazing of graphite, and hence it has generally been mistaken for shale, accompanying coal. No coal has, however, been discovered there, nor is there any reason to believe that it exists in this rock; no traces of vegetable impressions having ever been found upon its strata, while its dip is such, that it would disclose, on its outcropping edges, any

bed of this combustible, if included in its mass. Bog iron ore and earthy black oxide of manganese, are found upon this hill, and have been often mistaken for coal.

The limestone rocks of Thomaston, are included between strata of such rocks as I have above described, and the direction of the beds coincides with that of the strata; that is, the great mass of limerock which lies in the valley of Thomaston, and extends from George's River to Tolman's Pond, runs in a N. E. and S. W. direction. This bed of limestone is said to be nearly a mile wide, but its exact limits have not been determined, owing to the superficial soil, which conceals the rock beyond the quarries. A parallel bed runs from the State Prison, until it comes on a line with the meadow quarries. This bed, the limits of which are not certainly known, is contained in talcose slate, and is wrought at the two points I have mentioned. A bed of white magnesian limestone, of the variety called dolomite, is contained in similar rocks at the marsh, near the West Keag River. These are the principal beds of limestone at Thomaston, and they are wrought chiefly at the following places; Blackington's Corner, near Tolman's Pond, at the Meadows, State Prison, and Beech Wood quarries. Most of these localities are cut through by trap dykes, of greater or less dimensions, and the chemical changes produced by the injection of this rock, are marked exactly by the proportionate size of the dykes, and the nature of the limerock. It is interesting to observe, that the most valuable quarries opened, are those which are distinguished by the dykes; and even the lime burners, who certainly are not aware what opinions are entertained by geologists, and cannot be accused of theoretical bias, attribute a good influence to the presence of this rock. However this may be, it is certain that some cause of this kind has had a powerful influence on the limestone in question, and changes have been effected in it, which it would be difficult to attribute to so small a mass of igneous rocks as are *seen* traversing the quarries, we may rationally suppose, that the dykes are but salient veins, from more powerful masses of this rock below, and the neighborhood shews abundant proofs, that they are not wanting in the vicinity.

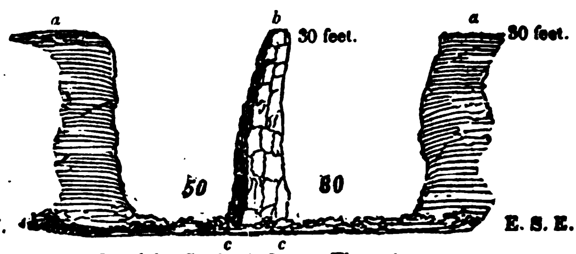
Let us now proceed to examine several quarries, beginning at Blackington's Corner,—Tolman's, Achorn's, and Crockett's quarries.

Achorn's quarry is an excavation, which, according to the measurements made by Dr. Purrington, is 300 feet long, 91 feet broad, and 16 feet deep—and furnishes 20,000 casks of lime per annum.

The limerock at this locality, shews a number of fractures in its mass, while the lines of stratification are distorted. A small quantity of sphene, tremolite and quartz, were found in this place, in a detached mass of rock. There is a small dyke in the quarry, three feet wide, but not of sufficient power to have induced all the changes that have taken place.

Crockett's quarry, adjacent to the one above noticed, is more interesting. There the lines of stratification are seen only in the different shades of color the rock presents, and the limestone is a mixture of blue, white and crystalline particles. The coloring matter, as ascertained by analysis, is chiefly carbon and oxide of iron. By measurement, it was ascertained by Dr. Purrington, that this quarry was 272 feet long, 80 feet broad, 27 feet deep, and yields 30,000 casks of lime annually. The lines of stratification run N. E. and S. W. The most remarkable object, at this locality, is its trap dyke, which stands like a wall in its centre, rising to the height of 30 feet, and the excavations have been made from either side. This dyke is 10 feet in thickness at its widest part, and it narrows at either extremity to an edge. The following diagram exhibits a section of this quarry.

W. N. W.



E. S. E.

Trap dyke, Crockett's Quarry, Thomaston.

a a Strata of blue limestone.
b Dyke of greenstone trap-rock.
c c White crystalline limestone.

The limestone, at its junction with the dyke, is closely cemented to it, and is converted into a perfectly white crystalline variety, which loses this character in proportion to its distance from the dyke. The same fact was observed in all the quarries thus intersected.

The *Meadow quarries* are generally marked by exactly such appearances as I have above described. They are situated in the midst of a plain, and are wrought to the depth of 10 or 15 feet. They are in the possession of about 60 individuals, and the particular quarries are named according to their proprietors. These quarries bear a general resemblance to each other, so that there would be no advantage in separating them for particular description. They are all cut across by a series of zig-zag dykes, and exhibit, in perfection, the chemical changes which have been effected.

Direction of the Dykes.

Achorn's quarry, E. and W. 8 feet wide.

Crockett's quarry, N. N. E. and S. S. W. 10 feet wide.

Meadow quarries, N. N. E. and S. S. W. 2½ feet wide.

Beech Wood quarries, S. E. by E.

The fractures in the limestone generally coincide with the direction of the dykes, so that it is highly probable that the phenomena were in some way connected, and I may be allowed to express the conviction, forced on us all, by the facts discovered, that the rocks at this place have been disturbed by some great convulsion of nature. On visiting the Beech Wood quarries similar phenomena were observed. The lines of stratification run in a N. E. and S. W. direction. There are two dykes which intersect this quarry, and the same crystalline appearance was observed at the junction of the two rocks. The walls of talcose slate may be distinctly seen, where they embrace the limestone. Large and beautiful crystals of calcareous spar, in the form of six sided prisms, are obtained here. The quarry is opened to the extent of 700 feet in length, 145 feet broad, 18 feet deep, and it yields annually 35,000 casks of lime. Northeast from this place is another quarry, 400 feet long, 93 feet wide, and 12 feet deep.

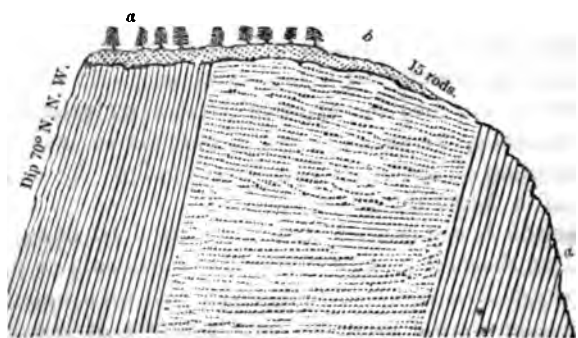
The State's Prison quarry was opened 50 years since, by General Knox, and has since become the site of a Prison. The limerock has here been excavated to the extent of

400 feet long, 130 feet broad, and 43 feet deep—and is now enclosed within the Prison walls. Here the strata were observed to run N. E. and S. W., and the general dip is to the S. E. 80°. Much of the limestone at this locality, is of a poor quality, owing to an admixture of foreign minerals. This is rejected in selecting the limestone for burning. Thirty-five thousand casks of limestone, in its unburnt state, are sold annually by the Warden of the Prison. The average number of prisoners employed in the quarry, is 37; and they are not permitted to converse with each other, while laboring.

A new quarry has lately been discovered, at a place called the Marsh, near West Keag River. I surveyed this locality, early last summer, before engaging in the Geological Survey of the State; and it is one of considerable importance. It is a bed of white granular compact dolomite, included between strata of talcose slate, which run N. N. E. and S. S. W., and dip 70° N. N. W. This rock exhibits itself on the borders of the little brook, which runs from a peat bog into the river. The width of this bed is supposed, from examinations that have been made, to be 240 feet; it extends 40 or 50 rods in the direction of the hill. The out-cropping edge of this rock is of a beautiful white color, and granular; and its lower surface is compact, and veined with dark lines. Its composition shews it to be a magnesian carbonate of lime; and, although it is commonly supposed that such limestone exerts an unfavorable influence on vegetation, it is evident here, that this is not the case; for it bears directly on its surface, a heavy growth of forest trees, such as, maple, birch, spruce, beech, fir, hemlock, and various wild wood plants. The peat meadow, at its base, is also covered with the usual plants. The notion respecting the unfavorable influence of magnesian limestone, is not supported by this locality.

The dolomite of this place, takes a fine polish, and may be used for marble slabs, columns, fire-places, &c.; and if sufficiently pure blocks can be obtained, it will form an elegant statuary marble. The fragments may be burned for lime. It must be remarked, that this variety of limerock swells considerably, when burned; and sufficient room should be allowed for expansion, otherwise it will burst the kilns. The

granular dolomite will fall into powder, when burned; but this is no disadvantage, unless it is to be kept a long time, or shipped for a distant port. Magnesian limestone forms, when burned, what is called hot lime, on account of the rapid manner in which it slakes, when moistened with water, evolving great heat in a sudden manner. Having collected a series of specimens, illustrating the nature of all the Thomaston lime and marble quarries, we made several excursions to the new and valuable localities of limestone, situate in Camden and Hope, intending to return to Thomaston as soon as our map of the town was completed, and the required statistical information collected. Dr. Cochran kindly offered to obtain answers to a series of questions, which I had given him in writing, which information being of statistical value, is inserted in the Economical department of the present Report.



Dolomite Quarry near the West Keag River at the Marsh.

a a Talcose slate.
b Dolomite.

We now proceeded to Goose River settlement, eleven miles North from Thomaston, where valuable quarries of limestone are wrought. On the point, near the village and close to the sea shore, are the Beauchamp's pits, where the limestone is of excellent quality, and is largely quarried and shipped, in its natural state, to be burned elsewhere. Most of the limerock burned at Goose River, is obtained at a place called the Lilly Pond quarries, where the rock forms a cliff 30 feet high, and presents an inexhaustible supply. This locality is situated half a mile N. E. from Goose River settlement, near the margin of a little lake, from which the

quarry takes its name. Although the quarry has been opened only four years, it is evident from the appearance of the cliff, that very large quantities of limestone have been obtained. There are also a number of small quarries opened to the North East of this locality, on the opposite side of Lilly Pond, where limestone is found abundantly. Like the Thomaston limerock, it is included between walls of talcose slate, and is colored by the presence of small particles of graphite or black lead. Some specimens, contain distinct scales of this substance, which are easily recognized. The strata which enclose the limestone, may be seen on the N. E. side of Lilly Pond. They run at this spot, in a N. W. and S. E. direction, and dip 70° S. W. The general direction of the rock, is N. E. and S. W.; so that the direction of the strata at the place where our observations were made, must have been disturbed, and their direction changed. Several small dykes of trap may be seen intersecting the limestone, on the N. E. side of the pond, and chemical changes are seen similar to those observed at Thomaston and elsewhere. Although the rock at Lilly Pond is now wrought wholly for making lime, it is evident that good blocks of marble, of the usual size, may easily be obtained, which may be wrought into slabs like that at Thomaston.

Goose River settlement is becoming quite celebrated for its lime, which is exported to New York, where it sells for the same price as that from Thomaston. This place has a population of about three or four hundred persons, and fifty men are here employed in the lime business, which gives the place an appearance of activity. Lime is also burned near the village of Camden, and is shipped in considerable quantities. While at this place, we were desirous of ascertaining the elevation of Megunticook Mountain, a commanding eminence, situated on the north of the village. The day selected for this purpose was remarkably favorable, the temperature and pressure of the atmosphere being very uniform, during the time our observations were taken. At nine A. M. the barometer placed on the sea shore at the foot of the mountain, and on a level with the sea, stood at 774^{mm}, temperature of instrument being 25°, that of the air 23° cent. After noting these observations, we set out for the mountain.

and after a fatiguing journey through the woods, and two or three unsuccessful attempts to scale the mountain on its inaccessible side, we found a path which led us to its summit, where we arrived at 12¾ o'clock. On the brow of this eminence, the barometer stood at 739^{mm}, temperature of instrument 23°, and that of the air 22° cent. Calculating these elements, we found the elevation of this point to be 1322 feet above the level of the sea. We soon after discovered that we had not reached the greatest elevation, which lies farther to the north; and we proceeded to that place, and repeated our observations. Here the barometer stood at 735^{mm}, the temperature of the instrument and of the air being 20°. Calculating these observations, the greatest elevation of the mountain is found to be 1457 feet above the sea. Megunticook consists entirely of a grey variety of mica slate, forming consolidated strata, which incline to the horizon at an angle of 70°. This rock is filled with numerous crystals of macle or hemitropic andalusite; and at its base, on the sea shore, an abundance of specimens may be obtained, which are polished by the action of the waves. The composition of this mineral, according to an analysis I made of a specimen from Lancaster, Mass., is in 100 grains, as follows,

Silicia,	33.0
Alumina,	61.0
Oxide of iron,	4.0
Water,	1.5
Loss,	.5
	100.0

From the summit of Megunticook, the view is exceedingly fine; numerous picturesque villages are seen scattered over the country for an immense distance. Camden appears at the foot of the mountain, while the beautiful Penobscot Bay, with its green islands and passing ships, forms a most beautiful panorama. The following bearings were taken with a pocket compass: East-Thomaston, S. by E.; Camden, S. E. by S.; Goose River village, S. S. E.; Owl's Head, S. E. by S.; Fox Island light, E. S. E.; Isle au Haute, E. by S.; Manhegan Isle, S.; Mount Desert, E; Matinicus

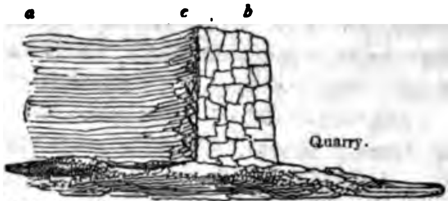
Island, S. E. ½ S. The enumeration of these places is sufficient to give some idea of the extensive prospect enjoyed from this summit, while their bearings will serve to aid the stranger, in recognizing the interesting points of view. [See PLATE.] On the southern side of this eminence, the rocks are precipitous, and rise perpendicularly to the height of 300 feet. Descending the mountain, our barometer was unfortunately broken by a fall, which accident prevented our taking the height of other interesting elevations.

After returning to Thomaston, where we obtained our plan, and a statistical report from Dr. Cochran, we set sail for Belfast, visiting the Lime Islands in our course. These islands are not appropriately named, since they were found to consist of talcose slate and trap rocks, containing epidote, no limestone occurring on them. From Belfast we went to Hope, passing through the towns of Searsmont, Belmont and Appleton. In Belfast the strata of talcose and argillaceous slate were observed running N. E. by N. and S. W. by S. In Belmont the same kind of rock is found, which passes into plumbaginous mica slate. On the right hand side of the road we observed some well defined diluvial marks on the slate running N. W. and S. E. and crossing the lines of stratification. Boulders of granite are abundantly scattered through the diluvial soil, although granite does not occur in this vicinity in place. Near Cobb's mills, in Searsmont, the talcose slate runs E. N. E. and is intersected by numerous beds of quartz, from six to ten inches thick, containing large flesh colored crystals of andalusite. Near Hope this slate is charged with plumbago, so that it may be cut into pencils, which will write upon paper.

The Hope limestone is contained in the talcose slate, which runs N. E. and S. W., and dips S. E. 80°. It is indistinctly stratified, and is cut through by numerous small trap dykes, while at the points of contact the limestone is frequently converted into dolomite. This limestone is extensively quarried, and furnishes excellent lime, which is admirably suited for transportation, since it is compact and slow in slacking. The most compact variety is known in commerce under the name of the Lafayette lime. It is a selected rock, and sells for a higher price than the ordinary varieties, which are a-

obtained here. The Hope limestone is also suitable for marble, of which it affords several beautiful varieties. No less than 20 quarries are wrought for lime in this town. We observed in one of the quarries, a dyke of trap, running N. N. E. and S. S. W., which cuts through the limestone strata, in the manner represented below. They have evidently been elevated by the upheaved dyke, while the blue limestone is converted into white granular dolomite, at points of contact with the dyke.

a *c* *b*

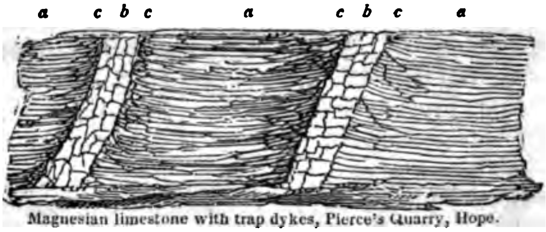


Magnesian limestone intersected by a Trap dyke, Pierce's Quarry, Hope.

a Strata of Magnesian limestone.
b Trap dyke.
c Dolomite.

Another instance in the same range was noticed, where there were two dykes, and the limestone at each intersection was changed in a similar manner. The following diagram illustrates this fact.

a *c* *b* *c* *a* *c* *b* *c* *a*



Magnesian limestone with trap dykes, Pierce's Quarry, Hope.

a a a Strata of Magnesian limestone.
b b Trap dykes.
c c c c Dolomite.

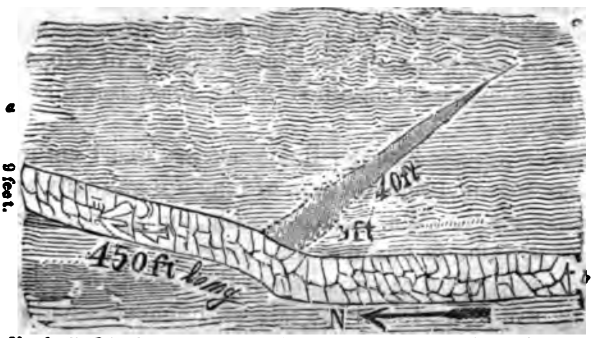
These appearances are quite interesting, and show the effect of the intrusion of dykes, into limestone containing magnesia, the stratified and compact rock, having been converted into granular, and semi-crystallized dolomite. Similar changes are observed in some of the beds at Thomaston, and where the rock contains no magnesia, the carbonate of lime is gen-

erally converted into calcareous spar. Von Buch supposed that dykes of pyroxenic porphyry, when injected into stratified limestones, rendered them magnesian; but after carefully examining the localities in Europe, which he quotes, I am convinced that the igneous rocks act only by fusing a limestone, which contained magnesia in its original state. The localities here, so frequently observed, confirm this view of the subject. Diluvial grooves in the rocks are exceedingly common in Maine, but I know of few localities where they are so distinct as at Hope and Appleton. Here they may be observed running in a N. W. and S. E. direction, while they are very deep and perfectly defined. Their direction, it will be remembered, does not coincide with that of the stratification of the rock, and could not have resulted from disintegration of the different strata. Three quarters of a mile S. E. from a hill in Appleton they may be seen forming deep channels in the rocks, to the depth of a foot, and six inches in width. Since the direction and appearance of these grooves, correspond with those observed in other parts of our country, I feel no hesitation in attributing them to a similar origin. They are certainly the result of an aqueous current, which once prevailed over New-England, and probably over the whole world. This current from similar grooves seen in other places, appears to have proceeded from N. to S., or from N. W. to S. E. Leaving the lime districts of Hope, we returned to Belfast, and there made arrangements with Mr. Pierce, proprietor of the quarries, to furnish a statistical account of the value of the lime business of Hope. The communications are contained in the Economical section of this Report.

Lincolnville has also her lime quarries, and I am informed that upwards of 100,000 casks of lime are annually exported from that place. We were not able, during our excursions the past season, to examine this locality.

After making an examination of the vicinity of Belfast and Castine, where we found the talcose, micaceous and plumbaginous slate rocks, we set sail for those Islands, which we had not examined in our cruise from Lubec to Thomaston. Passing Cape Rosier, we took a sketch of the deposition of the slate and trap-rocks which there occur. [See PLATE.]

We then ran over to Mt. Desert, and examined Baker's and Black's Island. At the latter place the bog iron ore is found in considerable abundance. We visited Marshall's Island, which we had been unable to examine before, on account of the violence of the surf. On the western side of the island is found a vein of very rich magnetic iron ore, contained in granite rocks. It lies beside a powerful dyke of trap, from which it strikes out in a lateral direction. The dyke is from nine to ten feet wide, and runs in a N. N. E. and S. S. W. direction, while the vein of iron ore runs E. and W., extending to the distance of 14 yards, nearly at right angles with the dyke. It is evident, that this vein of iron ore is of the same geological age with the dyke in its vicinity, for it joins it, and is mixed intimately with its substance. It appears to have been injected into the granite, with which it is closely connected. This iron ore is of the purest magnetic variety, and being possessed of polarity, is admirably suited for magnets of great power. The compass needle will not traverse within 30 or 40 yards of the vein, and when a crowbar or drill of steel is struck upon its surface, it instantly becomes a strong magnet, attracting large quantities of the powdered ore, which hangs in festoons to its extremity. When the crowbar was suspended by a piece of cord, it oscillated and pointed to the north, like a compass needle. This is the most powerful magnetic iron ore that I have ever seen.



Marshall's Island trap dyke and vein of magnetic iron ore in granite west side of island.

a Granite.
b Dyke of greenstone trap-rock.
c Vein of magnetic iron ore.

Although this vein is not of sufficient extent, to afford in itself, a continual supply of iron ore for the furnace, yet it may become important to collect the iron ores, from the numerous localities in the vicinity, which, together, will make up enough to keep a blast furnace in operation. There is no better iron ore in existence than this; and when mixed with the bog, and other lighter ores of Mt. Desert and Black's Island, it will become perfectly manageable, and will not overload the high furnace. So important an indication as this locality, should not be lost sight of, since larger quantities of this valuable ore may be discovered. Mt. Desert offers similar indications, and its mountains may be found to contain veins of this and other metallic ores. It will be remarked by those who examine the facts stated in this Report, that all the metallic ores which have been described, are found in those places where trap dykes have been thrown up; and no one can doubt that their origin was in some way connected. This fact is not only interesting in a theoretical point of view, but also offers a valuable guide to those who are seeking to discover metalliferous veins. It is also an indication that the various ores mentioned, were injected or sublimed from below, and that the veins may probably widen, and improve as they descend. This appears to be the case with the Lubec Lead Mines, so far as they have been examined. Many islands abound on this coast, between Mispecky Reach and Thomaston, which generally consist of granite rocks, and will furnish an inexhaustible supply of building stones. To enumerate and describe them all, would perhaps be tedious; and I shall, therefore, mention only a few of the most valuable localities which were visited, and refer to the geological map, I have prepared, for their situations. This map, copies of which are laid before you, will be published in the next annual report.

After exploring the most interesting islands in our course, we ran to Eastport; and from that place, made an excursion in the Revenue Cutter, to a very valuable lime district, situate on L'Etang, New Brunswick, where the Maine Mining Company have purchased an extensive tract of limestone, and are now engaged in the manufacture of lime, for importation into the United States. L'Etang is a promontory,

connected by a narrow isthmus with the main land. It has a deep and excellent harbor, where shipping may lie secure from every wind. This locality is destined to become one of the most valuable districts for the manufacture of lime, on the coast—the rock being of an excellent quality, and altogether inexhaustible. On account of its vicinity to our country, it becomes interesting to the citizens of Maine to know its value, and its capability of furnishing a supply of so valuable an article. In order that we might ascertain what competition other places may expect to meet with, in the supply of the market, this locality was examined; although it is not situated within the limits of Maine. The limestone of L'Etang, is a large bed of blue, grey, black and white rock, and covers an area of 40 or 50 acres. It is a stratified variety; the strata having a general direction to N. E. and S. W., and dip N. W. 75°. The bed or mass of strata is included between walls of trap, and is intersected by twelve dykes, which vary in width from one to twenty feet. It was interesting to remark at this place, where trap dykes of different degrees of magnitude had burst through the limerock, that the physical and chemical changes, which I have so frequently noticed under such circumstances, were presented in every shade, and exactly in proportion to the power of the dykes.

The coloring matter of this limestone, is chiefly carbon or graphite and oxide of iron, which gives to some of the strata a brownish black tint. The impure masses also include strata of plumbaginous, talcose and mica slates, which rocks are found on one side of the limestone region. It will be observed, that near the dykes, this limestone becomes lighter colored, and finally perfectly white, where it is connected with them. In some places it presents a massive crystalline aspect, but more commonly it is compact. There can be no doubt, that these effects were produced by the intrusion of a powerfully hot molten rock, which partially softened and fused the strata of limestone. Similar phenomena may be observed at Lubec, Hope, and Thomaston.

I was informed by Mr. Wilson, the original proprietor of this limestone, that it was purchased by the company, for *£1,000*, or $4,000. It is now much more valuable, and

being wrought by American enterprize and capital, cannot fail to become a source of profit to the United States.

Near L'Etang is an Island, called Friendship's Folly, which consists of red sandstone and a conglomerate of pebbles of porphyry, cemented together by a finer sandstone. Through the midst of this Island, bursts a large dyke of trap-rock, eight feet wide, which rises to the summit of the Island. [See PLATE.] The sandstone at this place, is like that at St. Andrews and Perry, and contains alternate bands of a grey color. The strata run N. E. and S. W., and dip to the N. W. 40°. The dyke runs N. 35° W. and dips westerly 75°.

Returning to Eastport, we saw several other localities of red sandstone, among which are the Spruce and Indian Islands; but it was too late to land upon them at that time.

SECTION FOURTH.

This section will comprise the north eastern boundary of the State, tracing up the St. Croix to Houlton, and from thence following the St. John River to the Madawaska.

By means of this route, I meant to intersect the principal strata which run through from Maine into the British province of New-Brunswick. From Calais we made an excursion to St. Stephens, for the purpose of exploring a large granite mountain, which rises from the river side to a considerable elevation. This granite belongs to a citizen of Maine, and will be wrought for building stones. It is dark colored, containing black mica, and will answer very well for architecture, and although it is not so handsome as the Calais granite, it will still become profitable, on account of the ease with which it may be obtained and transported.

Having engaged a strong waggon to carry us and our baggage through the woods, we set out for Houlton and examined the rocks on our way. For some distance from Calais we found a coarse aggregate of hornblende and felspar, forming a variety of hornblende rock, or coarse sienite. Granite also occurs here and there, but is not of a fine quality, or of any considerable extent. We then came to clay slate rocks, near Lewis' Pond, where the strata are intersected by dykes of trap. At Lewis' Pond, 20 miles from Calais,

there is a small, but very good hotel, kept by Mr. Simpson. The road to this place is good, and an excellent bridge crosses a branch of the river.

Passing over this bridge we entered the Indian Township, the wood on one half of which has been burned, and still remains standing. The soil appears to be excellent, and the rocks are slate. The road was good until we arrived at Mr. Gleason's, 30 miles from Calais, where it is rough for three miles, as it cuts through the corner of Talmadge. I remarked also, that the road was laid down erroneously on the map of the public lands, and have corrected it as far as I was able, as will be seen on the map laid before the Board. The rocks are slate, and the soil is good, derived from the decomposition of the rock in this place, and from an admixture of diluvial sand formed from decomposed granite. Boulders, or rounded masses of this rock, were observed on our way, and have evidently been transported from the north, where we soon found them in place on No. 8, near the Baskenhegan Lake. On the shores of this lake we observed also slate rocks in place. Mr. Anderson furnished us with accommodations at his house, near Jackson Pond, 42 miles from Calais. After examining the shores of the lakes without discovering any very interesting geological appearances, we continued our journey to Mr. William Butterfield's, 54 miles from Calais, and from thence we explored the vicinity of the Grand Schoodic Lake. Limestone and bog iron ore are said to occur on the banks of the Mattawamkeag, west from Butterfield's, but we did not go thither to explore it, as it would have taken up more time than could be spared from the public lands. After passing Butterfield's there is no road. The trees are felled so that a light waggon may lumber slowly through, but we found it extremely laborious to effect a passage with a double waggon. After going on three or four miles, the road becomes more passable, and on reaching the ridge called the Horseback, it is very good all the way to Houlton.

This ridge is extremely curious, and consists of sand and gravel, built up exactly like the embankments for rail roads, the slope on either side being about 30°, while it rises above the surrounding low lands to the height of 30 feet, its top

being perfectly level and wide enough for two carriages to pass abreast. Its surface was originally covered with maple, birch, and hard pine trees, while the low lands, on either side, are covered with a dense growth of cedars. I could not help thinking, as I looked upon this natural embankment, that it would be easy for an antiquarian to mistake this ridge for a work of art, and to suppose that some of the aboriginal inhabitants of our country knew how to annihilate distance by rail roads. My first impression respecting the geological origin of this embankment, was, that it was alluvial, and formed the bank or intervening shores of two lakes, which existed in the low tracts, now covered with cedars; but on examining the nature of the materials, of which it is composed, I became satisfied, that it belonged to the formation of transported clay, sand, gravel and boulders, which is called diluvium, consisting of the loose fragments of rocks, that were transported by a mighty current of water, the last time the waters prevailed over the land. The occurrence of similar embankments at Houlton, served to confirm this opinion; for there they have the same north and south direction —a coincidence so remarkable, that it could not be the result of chance. The Horsebacks of New Limerick and Houlton are much more elevated, and some of them are said to rise to the height of 90 feet. Those which I examined, however, were not more than 50 feet high. It will be noticed that many of the fragments of rock, which these diluvial accumulations contain, are similar to the slaty limestone found farther to the north, and up the St. John river. I cannot stop now to speculate on the causes of this transportation of loose materials, but I may say that there are abundant proofs, on the whole face of this continent, that there has been a mighty rush of waters over its surface, from the north and northwest, and that such a current has swept over the highest mountains of Massachusetts. (*Vide Report on Geol. of Mass. by Prof. Hitchcock.*)

On the road from Calais to Houlton, the traveller will continually observe that the loose and rounded stones, which lie upon the soil, are not similar to rocks that occur beneath it, but that they can be identified with rocks, from which they doubtless originated, farther north. By a series of observations, it is possible to ascertain the limits of diluvial

transportation; but in this section of country my efforts failed to prove satisfactory, on account of the dense forests and the covering of soil, which concealed the rocks in place, so that I could not feel certain in my results. I know of no such observations having been made elsewhere, but it seems reasonable, that it can be approximated, with some degree of accuracy, by taking into consideration all the conditions of the problem. On our way from Butterfield to Houlton, we discovered an abundance of black oxide of manganese and iron ore, on the road side, and imbedded in rocks in place. After our arrival in Woodstock, I had the pleasure of discovering an enormous bed of this ore, which runs directly towards the spot, where we had picked up the specimens above mentioned.

The soil from Calais to Houlton is generally good, and bears a luxuriant growth of maple, birch, hemlock, spruce, and pine trees, while the low lands are thickly crowded with cedars. The geological nature of the soil is of three kinds, diluvial, alluvial, and soil resulting from the disintegration of the rocks, beneath; and it is not unfrequent to find all these varieties on the same farm. The mineralogical nature of the rocks, producing soils, explains their origin. We have then, a soil derived from granite, of a yellow color, containing grains of quartz, mica, and felspar, while the chief part of the latter mineral, is decomposed into clay. Soil derived from argillite, is of a blue color, and contains fragments of slate. Alone, it forms a tenacious clay, and cold soil; but when mixed in due proportions with the detritus of granite and limestone, it forms a good soil. Limestone soil of this vicinity, is of a brownish yellow color, mixed with blue particles of slate. Houlton is remarkable for her limestone soils, which are extremely luxuriant, and admirably suited for the growth of wheat, other grain, and grasses. They are very deep and warm, and always kept loose and spongy, by the small fragments of slate, which they contain. There are also rich alluvial soils in this place and at New Limerick near by, which yield to no other districts in the luxuriance of their productions.

After exploring in a hasty manner, the most important places around Houlton, in which we were kindly assisted by

the politeness of Mr. Carey, who resides in Houlton, and is well acquainted with the localities, we set out for Woodstock, on the British side of the line, and there met with kind attentions from Major Ketchum, whom we had seen in Houlton. This gentleman afforded us much aid in our enterprise, which we are happy here to acknowledge. While in Woodstock, I saw some specimens of red slate, covered with black oxide of manganese, which I instantly recognized as the matrix of the hæmatite iron ore; and on expressing my opinion that iron would be found at its locality, I was conducted thither, and discovered an enormous bed, not less than 50 or 60 rods wide, and extending towards the district I have described at Hodgdon. This bed of iron ore forms the summit of a hill, and is favorably situated for working the metal, charcoal being easily obtained at a low price. The ore will yield not less than 50 per cent. of pure iron, and 60 per cent. of cast iron. It is the most easy ore to smelt in the blast furnace, and is not difficult to break, nor will it overload the furnace. Situated near an important military post, this bed of iron ore is of national importance, and should not be overlooked by government. Should the ore ever be wrought, it ought to be remembered that the Tobique River has on its banks a plentiful supply of red sandstone, suitable for making the hearth and lining of a blast furnace, and will also afford limestone required for a flux in smelting the ore. It is not a small advantage to have these indispensable articles on a river up stream, so that they may be brought down, at a trifling expense, in boats or on rafts.

Having engaged our passage in a horse tow-boat, we set out for the Grand Falls, carrying our provisions and camping apparatus with us, and travelling slowly up the St. John's river, at the rate of 15 miles per diem, so that we could have leisure to explore the banks of the river, by walking along beside or in advance of the boat, and putting our specimens on board when it stopped. In the vicinity of Woodstock, large dykes of trap rocks are seen cutting through the slate and limestone, and running in an E. N. E. and W. S. W. direction. We found the strata every where visible, as they were exposed by the river, which was low at the time, and disclosed their outcropping edges. We noted the direction

of the limestone and slate in many hundreds of places along the river's banks, as we proceeded, and found it to be E. N. E. and W. S. W., and the dip W. N. W. Many dykes were observed, cutting through the limestone, with veins of calcareous spar accompanying them. Fossil shells, such as terebratulæ and trilobites, were found, but they are rare along the river's course. Large and perfect specimens of terebratulæ were found in blocks of grey limestone, which we traced to their origin on the Tobique River.

Masses of red sandstone occurred also in abundance, as also did large pieces of beautiful red jasper, carnelian and chalcedony, which were mixed with rounded and water-worn pieces of amygdaloidal trap. All these minerals we traced to the Tobique—not a specimen being found after we passed above the mouth of that river. The occurrence of red sandstone, in erratic blocks, along the course of the St. Johns, served to satisfy me, that the coal measures were somewhere in the vicinity; and I am of opinion, that this substance may be found between the Tobique and the Grand Lake, on the St. John. We know that it has been found at the latter place, and there is a good prospect of its being found continuous to the Tobique; for there, that formation exists, and a powerful bed of gypsum has been found, embraced in the new red sandstone, at that place. I had previously predicted that this formation would strike the St. John at this point, and hoped to have found it on the western side of that river, but it has not yet been observed extending so far. There is, however, no impossibility of its existing on the public lands, west of the St. John, for there are frequent interruptions in the extent of the coal measures, and an independent coal basin may as well occur there, as on the opposite side of the river.

No fragments of sandstone were observed in the bed of the Aroostic, at its confluence with the St. John, all the transported masses of rock found there, consisting of stratified blue limestone and argillaceous slate. If it should happen to be the case, that the direction of the sandstone strata, is such as to confine it to the eastern side of the St. John River, it would then, if continuous, extend to the lands belonging to Maine and Massachusetts, north of the Grand

Falls, and will be found on the range of highlands, forming the northern boundary of the State. In a future excursion, I propose to trace the known coal-bearing strata of New Brunswick, up the St. John, from the Grand Lake coal mines to the Aroostic; and thence, if the strata are found to be continuous, following their course until they intersect the public lands.

It is certainly a very important fact, that there are large beds of gypsum on the Tobique River, for that substance is well known to be exceedingly valuable in agriculture, and it can be brought down the Tobique and the St. John, to any point required, on the public lands which lie along the St. John, within from two to six miles of the river, while it would be impossible to bring the Nova Scotia gypsum up the river, on account of the expense of freight, which would cause its price to rise so high, that it never could be afforded for agricultural purposes. It may also be remarked, that gypsum is not subject to any custom-house charges, and boats are not subject to tonnage duty; so that the Tobique gypsum is just as valuable to Maine, as if it occurred within the limits of the State.

The rocks along the course of the St. John, up to the Grand Falls, consist entirely of stratified blue limestone and slate, which are traversed by numerous dykes, and the rocks rise, in some places along its banks, to the height of from 200 to 300 feet above the river. Much of this limestone, I have no doubt, will furnish excellent hydraulic cement, a similar rock being used for this purpose in Quebec. On the Aroostic, good limestone, for the manufacture of lime, abounds, and much of that on the St. John, will answer for the same purpose. Iron ores also occur on the Aroostic, within the limits of Maine, and about six miles from the boundary line. The details of our observations on this river, will be seen marked on the map laid before the Board of Internal Improvement. It will be remarked that there are high banks of diluvial soil resting on the rocky banks along the river, and that the whole tract along its course to the Grand Falls, possesses an uncommonly fertile soil, covered with an abundant growth of forest trees, of every kind found in the State. This river below the falls, is broken by numerous and powerful rapids, through which it is extremely difficult, and sometimes dan-

gerous to pass in a boat. The most remarkable of these rapids, are at the Presque Isle, Tobique and Salmon Rivers, and between the Salmon River and the Grand Falls, the two latter being called the *Rapid de Femme* and the *Rapid Blanche*, both of which are dangerous and difficult to pass with boats.

The present mode of towing heavy flat bottomed boats, by means of horses, wading along the banks of the river, is exceedingly tedious; but owing to the rapidity of the current, and the presence of rocks, breaking the surface of the water, there is little prospect of steam boats ever being used in the navigation of the river above Woodstock.

The Grand Falls are produced by the falling of this river over high ledges of slate and limestone rocks, where it makes a sudden turn in its course. This cataract is a most magnificent waterfall, and tumbles by a series of three successive leaps over the rocks, to the distance of 125 feet, with a tremendous crash and roar, while it rushes through its high rocky barriers, and whirls its foaming waters along their course. When the sun's rays fall upon the mist and spray, perpetually rising from the cataract, a gorgeous iris is seen floating in the air, waving its rich colors over the white foam, and forming a beautiful contrast with the sombre rocks, covered with dark cedars and pines, which overhang the abyss. (*See Plate, view of the Grand Falls.*)

Sir John Caldwell has just erected a saw mill beside this waterfall, and has constructed a rail road of timber across the high promontory of land, so as to transport the deal boards and logs from the mill, to the river below the falls. Although it is sometimes agreeable to see the useful combined with the beautiful, I do not suppose that lovers of the picturesque, will imagine the beauty of the Falls enhanced, by the erection of saw mills by its side; nevertheless, if they prove advantageous to the public, we must yield in matters of taste, to the demands of commerce. There is, however, nothing repulsive in the appearance of these works, and they may be shut out of the view, if found to detract from its interest. Travellers, who may visit the Grand Falls, will find many very magnificent scenes, which are peculiar, and will interest even those who have seen the more stupendous cataract of

Niagara. We are indebted to Sir John Caldwell for many polite attentions, which we beg leave here to acknowledge.

Having engaged two Acadians to carry us up the St. John to the Madawaska River, in their birch bark canoes, we set out on our voyage, and examined the shores on either side of the river, as we proceeded slowly up against the current. The St. John is much broader above the falls than it is below, and there are but few rapids, and none of them dangerous to the canoes. The boundary line is but three miles west of the falls, and was marked by the surveyors who ran the line seven or eight years since. The whole tract between the Madawaska and this line, is settled by Acadians, and is known under the name of the Madawaska settlement. This district was incorporated as a town, by the State of Maine, but difficulties having ensued, as to the right of jurisdiction, it was agreed to leave the place *in statu quo*, until the claims of the two countries should be adjusted; an injunction being placed, by mutual agreement, against cutting of the timber upon the disputed territory. It is well known that Maine regards the usurpation by the British authorities, as unjustifiable, her unoffending citizens having been seized and committed to prison, on no other pretence than their endeavor to carry into effect the laws of the State to which they belonged, by calling a town meeting. We met with Mr. Baker, at the Grand Falls. He was one of the persons arrested at the Madawaska town meeting, and was subjected to the indignity of a foreign jail. This gentleman gave us much information relating to the timber districts of Madawaska, and the means of transporting the timber down the St. John River.

The population of Madawaska settlement, is estimated at 3000 souls, 900 of whom dwell above the Little Falls. Most of the settlers are descendants of the French neutrals or Acadians, who were driven by British violence, from their homes in Nova-Scotia, (called, by the French, Acadia,) on the 17th of July, 1775*. These people at first established themselves above Fredericton, and subsequently removed above the Grand Falls, and effected this settlement. The Acadians are a very peculiar people, remarkable for the

* See Halliburton's History of Nova Scotia.

simplicity of their manners and their fidelity to their employers. Although they are said to be "sharp at a bargain," they are remarkably honest, industrious and respectful; and are polite and hospitable to each other and to strangers. It is curious to observe, how perfectly they have retained all their French peculiarities. The forms of their houses, the decorations of their apartments, dress, modes of cookery, &c., are exactly such as they originally were in the land of their ancestors. They speak a kind of *patois*, or corrupted French, but perfectly understand the modern language, as spoken in Paris. But few persons can be found who understand or speak English, and these are such as from the necessities of trade, have learned a few words of the language. None of the women or children either understand or speak English.

The Acadians are a cheerful, contented and happy people, social in their intercourse, and never pass each other without a kind salutation. While they thus retain all the marked characteristics of the French peasantry, it is a curious fact that they appear to know but little respecting the country from which they originated, and but few of them have the least idea of its geographical situation. Thus, we were asked, when we spoke of France, if it was not separated from England by a river, or if it was near the coast of Nova Scotia; and one inquired if Bethlehem, where Christ was born, was not a town in France!! Since they have no schools, and their knowledge is but traditional, it is not surprising that they should remain thus ignorant of geography and history. I can account for their understanding the pure French language, by the circumstance that they are supplied with catholic priests from the mother country, who, of course, speak to them in that tongue. Those who visit Madawaska, must remember that no money passes current there but silver; for the people do not know how to read, and will not take bank notes, as they have often been imposed upon, since they are unable to distinguish a £5 from a $5 or five shilling note. As there are no regular taverns in this settlement, every family the traveller calls upon will furnish accommodations, for which they expect a reasonable compensation; and he will be always sure of kind treatment, which is beyond price. I have been thus particular in speaking of the Acadian settlers of Madawaska, because little is generally known

of their manners and customs; many people having the idea that they are demi-savages, because, like the aboriginal inhabitants, they live principally by hunting. Owing to the injunction placed on the timber lands, ten families of the Acadian settlers have emigrated to Michigan Territory. It is very desirable that this obstacle to the prosperity of the people of Madawaska, should be removed by an adjustment of the present difficulties, respecting the North Eastern Boundary of the State.

The geology of Madawaska is simple, and not very interesting; the rocks consisting of argillaceous slate and blue limestone, which is covered with a deep and luxuriant soil, bearing an abundance of cedar, pine, spruce, birch, maple, hemlock, and other forest trees, which abound in these regions. A few beds of plastic clay were observed, suitable for pottery and brick making; one of which is situated on the north bank of the river, 18 miles above the Grand Falls, and four miles above the residence of Captain Tiberdot; another occurs on the same side of the river, opposite Grand Island, and near the Green River. This latter bed is interesting, on account of its containing lignites, which are evidently remains of cedar trees, completely penetrated with a beautiful blue earthy phosphate of iron, which may be used as a pigment. A fossil unio was also found in this clay. Below the plastic clay, occurs a bed of pisolitic iron ore, and beneath this a stratum of green sand, which may be used with lime for a manure. The cliff rises 30 feet abrubtly from the river, and presents a section of the variously colored blue, brown and green strata.

Slate rocks, suitable for roofing, occur three miles above Green River, on the north side of the St. John, where they form a precipice thirty feet high, and extend along the river one-fourth of a mile. Hills, composed of the same kind of rocks, occur on the southern side of the St. John.

At the mouth of the Madawaska River, slate rocks are again seen, and run E. N. E. and W. S. W.—and stand in vertical strata. The Madawaska falls over these rocks, to the distance of five or six feet. It would be practicable to convert this fall into a valuable mill privilege, but a dam must be built to the height of twelve feet, since the St. John,

during freshets, is crowded with water, which overflows these rocks to that height. The Madawaska River is thirty-five miles above the Grand Falls of the St. John.

After examining, as far as we were able, along the banks of this river, amid snow storms, while the thermometer stood below freezing, we were compelled to return, on account of the snow, which covered the rocks and soil. The river had nearly reached the freezing point, and our clothes were covered with ice, while the snow fell abundantly in our canoes. Descending the St. John, the canoes glided with great ease and rapidity, and we soon found ourselves at the Grand Falls; and transporting our canoes over the land, we again set out, on the river, to Woodstock, from whence we took passage to Houlton, and carried with us five boxes of specimens of rocks and minerals, which we had collected on our route.

The following Thermometrical Register was kept during the last days, while we were on the river :—

At Madawaska,	OCT. 18—Temperature of the air at noon,	33° F.	Snow storm; violent wind; water froze on our garments.
	" " " of the river, .	38° F.	
	" 19—Half-past 6 A. M., temp. of air,	25° F.	
	" 20— " " 8 " " "	32° F.	—Rain and snow.
	" 21— " " " " " "	28° F.	—Snowed a little.
	" 22— " " " " " "	28° F.	—Snow.
At Grand Falls,	" 22— " " " " " "	34° F.	
	" " 9 P. M., temp. of air,	36° F.	
	" 23—" " " of river,	33° F.	

Before closing this Section, I would remark, that it is of the greatest importance to the State, that the boundary question should be adjusted, as soon as possible, for not only is the timber, on the disputed territory, plundered on a large scale, but it is also in many places necessary to have it cut, before it is ruined by decay. I was informed by Mr. Baker, that on the district of St. Francis, where a fire has killed the foliage, there are no less than 10 or 12,000 tons of very valuable pine timber, which is now fit for use, but which in a few years will be good for nothing, unless it is cut down to prevent its rotting. Although there is a prohibition against cutting timber on the public lands in dispute, it is no secret that this law is evaded.

From the observations of persons, who are in the habit of rafting logs of timber down the St. John, it will appear that the current of the river above the Grand Falls, is from one

to three miles per hour, while below the falls, it runs at the rate of from three to six miles per hour, the swiftest current being at the rapids, and in the narrowest parts of the river. When the snows of winter begin to melt from the mountains and high lands, the St. John rises with great rapidity, and frequently the water accumulates, during freshets, to the height of 30 feet above its ordinary level, so that the rocks at the rapids are entirely submerged, and the banks of the river are overflowed in many places. When the ice breaks up in the spring, it is said that this river presents a sublime spectacle, the ice being crowded into a narrow space, and heaped up sheet upon sheet, in an enormous mass, so as to arrest the passage of the water, when it accumulates and finally overcomes the opposing barrier, moving it forward with a noise like thunder, and sweeping down every obstacle in its course. Rocks, frozen into the ice, are thus transported down the river to a great distance, and even carried out to sea. It is probable that most of the large masses of sandstone, trap-rock, jasper, and carnelian, found a little above Woodstock, are thus brought down from the Tobique, and deposited along the banks of the St. John, 50 or 60 miles below. Moving ice is a powerful cause, modifying the surface of the earth, and probably was one of the means, by which the various scattered blocks of stone and boulders of large size, were transported to a distance, during the last grand deluge that overwhelmed the globe.

On our return from the St. John, we passed by the military road from Houlton to Bangor, and had but few opportunities of exploring the rocks on our way. We observed, however, that the limestone and slate rocks, alternating with each other in regular strata, run as far as the Forks of the Mattawamkeag, where we lost sight of them, the whole surface of the rocks being covered with diluvial and alluvial soil, on either side of the road.

In the town of Lincoln, we saw some large and beautiful blocks of granite, which were quarried in that place, but we had not time then to visit the locality. The soil along the whole extent of the military road, is deep and rich, consisting of disintegrated particles of limestone and slate, which are known to form an excellent soil for wheat and other grain.

While engaged in a private survey, before entering upon my public duties, I explored the slate region of Williamsburg and Brownville, situated 40 miles N. N. W. from Bangor; where an inexhaustible supply of roofing slates may be obtained. The Williamsburg quarries are situated on Whetstone Brook, a branch of Pleasant River, and the rock forms a precipitous bank to the stream. The slates are divided into regular sheets, standing in a nearly vertical position, the dip being 85° north, and their direction east and west. It is difficult to say, whether the divisions coincide with the stratification or not, there being no other rocky strata alternating with the slate. From the uniformity and extent of the divisions, it seems probable that they are the lines of stratification. By driving a chisel between the layers of this slate, sheets of a perfectly even surface may be split off with great ease, which are of suitable thickness for roofing, and from two to five feet square. When struck, the slates ring like those from Wales, and are perfectly free from cracks. Not the least trace of pyrites, or other substance, calculated to cause the disintegration of the slate, is found at this quarry, and I have no doubt, that it will be wrought to advantage. Access to this locality is at present difficult, owing to the forests which surround it. Whetstone Brook, it is said by Mr. Greenleaf, may easily be cleared of rocks, and rendered navigable to boats during freshets. I should think it far more expedient to lay an ordinary rail road, supported on timbers, from the quarry to Pleasant River, the distance to navigable water being two or three miles. On the side of a hill, a little west of this quarry, occurs another good locality of excellent slates, which may be split into very thin sheets. I found that I could obtain fifty-four distinct and perfect slates from a slab one foot in thickness.

The Brownville slate is situated 200 rods N. E. from Pleasant river, and forms a steep precipitous hill, rising from 100 to 120 feet above that river, and having a steep descent to its banks, the intervening land being at present covered with forest trees. This locality is inexhaustible, and the slate is of an excellent quality, containing no pyrites and is capable of resisting, as may be seen on its exposed surface, the action of air and water for ages, without undergoing decomposition.

The sheets of slate were observed to run E. by N. and W. by S., and they dip N. W. 70°. Slates, from one to six feet square, may be split with great ease from this rock, and in any quantity desired. A great natural advantage is presented at these localities, by the nearly vertical position of the strata, while they occupy elevated ground, and may be transported to the river by a regular slope of the land, a rail way being made for the distance, which is only 200 rods. So valuable a locality should not be allowed to remain unwrought, and I am happy to learn that it is in contemplation to begin operations at this place early next summer. While at this locality, some calculations were made respecting the cost of transporting the slate; and from data, furnished by gentlemen well acquainted with the navigation of the Penobscot, it appeared that it could be landed in Boston, at the cost of $8 per ton. Now the Welsh imperial slates sell for $27 per ton, and this locality will furnish an equally good article. I feel no hesitation in saying, that, in my opinion, Maine is capable of supplying all the United States with good roofing slates. The whole section from Williamsburg to Bangor, appears to be composed of argillaceous slate; I have observed it on either side of the river below that city. Doubtless other quarries will be found, equally valuable with those of Williamsburg, but I have not yet visited any which can be wrought so advantageously.

SECTION FIFTH.

This section comprises the observations which I have been able to make, in a rapid reconnoissance of the vicinity of Portland, and of the route over which I travelled in the summer of 1835, while on my way to Lubec; it also includes some researches made by Mr. F. Alger and myself, in 1827, during a mineralogical excursion, upon the peninsula of Phipsburg.

Having made but a few excursions around Portland, I cannot pretend to describe minutely its geology, but shall make a more detailed examination of that region in the course of our next campaign. I beg leave, in the mean time, to refer you to an interesting account of the geology of Portland

and its vicinity, by Professor Hitchcock, published the last summer, in the Journal of the Boston Society of Natural History, Part I. No. III.

Cape Elizabeth is composed entirely of talcose slate, containing occasionally beds charged with minute crystals of hornblende and laminæ of iron pyrites. It is intersected by several trap dykes, which may be seen near the light houses at the extremity of the Cape. They run in an E. N. E. and W. S. W. direction, cutting through the strata of talcose slate, one of the dykes being five feet wide. Numerous veins of quartz, charged with decomposing sulphuret of iron, are found at this place, and the quartz resembles precisely the specimens which I have seen from the gold mines of Virginia and the Carolinas. I examined some of these decomposed veins, in order to ascertain if any particles of gold could be discovered in them, but was unsuccessful in my search. The gold regions of the Southern States are composed of rocks similar to those found at Cape Elizabeth. Between the latter place and Portland, a bed of talcose slate is charged with graphite, and the strata there contain layers of carbonate of lime. In Portland, the talcose slate is observed, containing abundance of iron pyrites, which exists between the layers of rock in extremely thin laminæ, covering its surface with glittering, silvery and brass-colored leaves, which formerly were supposed to be of a more valuable metal. The strata of this rock run N. E. and S. W. and dip 80° N. W. It is quarried for repairing the streets. Near Thurston's wharf it is of a greenish color, contains layers of calcareous spar, and presents a number of remarkable contortions. On the sea coast at Mount Joy, may be seen all the varieties of this rock, alternating with quartz rock.

Professor Hitchcock regards the rocks which I have described under the head of talcose slate, as mica slate, a rock into which it passes by imperceptible shades. It is evidently a metamorphic rock, having been altered since its deposition by the elevation of igneous rocks beneath it, so as to render its characters variable. I have preferred to designate it by the name of its characteristic and most abundant mineral. It is probable that this rock was produced by the alteration of a sedimentary deposit of an argillageous character, it having

since undergone metamorphosis, by igneous action, during the elevation of granite. Its passage may be distinctly traced into argillaceous slate on one hand, and mica slate on the other, and specimens may be selected, which will illustrate the fact.

The graphite or plumbago contained between the laminæ of this rock, was probably derived from vegetable matter originally deposited with it, when in its sedimentary state; heat and pressure being capable of converting vegetable substances into graphite, as we see it formed from charcoal in the high blast furnace. Many of the islands of Casco Bay, consist of rocks similar to those of Portland, and which are frequently filled with iron pyrites, so as to cause the rapid decomposition of the strata. Jewel's Island is intersected by a trap dyke, which, according to Prof. Hitchcock, is a continuation of one from Cape Elizabeth. On this island, are found numerous veins of pyrites, and the rock, which is of a more argillaceous character than that of Portland, is filled with particles of this mineral, so that it is advantageously wrought for sulphate of iron and alum. On Haskell's and Hope Islands, similar rocks abound, and on the latter, there is a large trap dyke intersecting the strata.

Orr's Island, is interesting on account of a large bed of soapstone, which occurs in the micaceous and talcose slate. The soapstone is included between strata which run N. N. E. and S. S. W. and dip 80° W. N. W., and is found on the south east side of the island, where it is exposed upon the borders of the sea, and is 14 feet wide. It runs across the island, passing directly under the house of Mr. Orr, it having been found in excavating the cellar. Although this soapstone is hard to saw, and does not take a fine polish, yet it is capable of being wrought into excellent slabs for the construction of stoves and fire grates, since it is very refractory, and does not crack or melt, when exposed to an intense heat. It is favorably situated for transportation, being close to the water's edge, and partly covered by the sea at high tide. I believe no attempt has been made to quarry this soapstone, although a similar kind is wrought at Jaquish and Harpswell. Near the bed of soapstone, are found many small garnets in the mica slate, and veins of quartz, containing large and

perfect crystals of andalusite, some of the crystals, in my possession, measuring two inches in diameter. Returning from this locality to Portland, we visited Hog Island, where the talcose slate, at Brimstone Point, has been powerfully acted upon by decomposing pyrites, and has a yellow color, from which the point takes its name.

Professor Hitchcock has described an interesting example of the tertiary formation, which exists in Westbrook, on the north bank of the Presumpscot River, where a land slip has disclosed a bed of clay, filled with several species of fossil shells, one of which he has named nucula portlandica, a figure of which is given in his essay, to which you are referred for the detailed description of this locality. Diluvial scratches or grooves are also described, as existing in Portland, running south 10 or 15° east. They are said to exist also in the neighboring towns of Westbrook and Yarmouth, where they are very distinct and characteristic. Diluvial boulders of granite and gneiss are also found in Portland, and are supposed to have been transported from the north west, where they occur in place. My own observations have confirmed the accuracy of Prof. Hitchcock's remarks on this subject, and many other more decisive instances may be seen in other parts of the State, where diluvial phenomena have been noted.

We pass but a few miles northward from Portland, before the parent rocks, from whence these diluvial blocks were swept, occur in place. At Westbrook, a little more than a mile from the city, the gneiss may be seen immediately on the road side, where the talcose slate rests upon it. In Falmouth, the coarse granite, containing large crystals of black tourmaline, is found, and may be seen on the right hand side of the road. Brunswick is underlaid entirely by gneiss, which is intersected by numerous and powerful veins of granite, containing large crystals of felspar, suitable for the manufacture of porcelain. Some of the veins on the Androscoggin, near the bridge to Topsham, are 25 feet wide, and will afford sufficient felspar for the supply of porcelain works. I have had some of the mineral wrought into mineral teeth, by a distinguished dentist in Boston, in order to see whether it would answer for this purpose, and he declares that it

makes a most perfect porcelain, which is of a pure semi-transparent appearance. Many interesting minerals have been found in Brunswick and Topsham, which have been described in the excellent Treatise on Mineralogy, published by Professor Cleaveland. It would require too much time to name them here, but I shall enumerate them in a catalogue of the minerals of the State, which I shall hereafter have the honor to lay before you.

In the south eastern part of Brunswick, four miles from the village, occur three or four beds of white crystalline limestone, which are of great value for the manufacture of lime and for marble. These beds are included in gneiss, and vary in thickness, from nine to twenty-two feet, while their depth and length are unknown, but are probably of very great extent. Their direction was found to be north and south, and the dip 62° east. Near the house of Mr. Jordan the widest bed is found, and blocks of beautiful white marble may there be obtained, 20 feet in thickness, and of any length and width required. The fragments may be advantageously burned for lime, which will be of perfect purity. I have no doubt that marble may be wrought to great advantage at this place. It is not suitable for polishing, as its crystalline texture is coarse and would not appear to advantage. It will, however, when smooth hammered, form as handsome a material for architecture, as the marble of Carrarra. A much coarser variety is used in New York, in the construction of the new custom house, and it forms an elegant material, its coarse texture not being visible at a few paces distance from the building. The Brunswick marble can be easily quarried, and I am surprised that it should have been allowed to remain so long unwrought.

Bowdoinham, near Brunswick, presents an interesting locality of fine green beryls, which may be obtained either by blasting the rock, or by digging into the earth where the rock has disintegrated. Several years since, I dug up, in this manner, no less than two bushels of crystals in a few hours. Garnets also abound in this place. Near Bath, on the peninsula of Phipsburg, Mr. Abraham Hammet discovered, several years since, some rare and beautiful crystals of cinnamon stone-garnet, and idocrase. In 1827, I visited that place in

company with Mr. F. Alger, and discovered some rare minerals never before found in America, viz: axinite in crystals, half an inch in diameter, and ferruginous silicate of cerium in deep brownish black crystals, imbedded in garnet. At the same time we found the mineral called laumonite, and many splendid crystals of yellow and manganesian garnet, one and a half inches in diameter, the latter minerals being found at the lime quarry at Phipsburg basin.

It will be unnecessary for me now to describe these minerals, and I shall speak only of the geological features of this place. The whole peninsula of Phipsburg is composed of gneiss, intersected by frequent veins of granite and sienite. This gneiss contains at the basin, a valuable bed of crystalline granular limestone, which is colored grey, by the presence of particles of graphite or plumbago. The bed is at least 40 feet in thickness, but we could not ascertain its precise limits. The limestone is quarried and burned for lime, which is of a good quality. The rock is not sufficiently compact for marble.

It is well known that fragments of bituminous coal are washed up on the shore, near Small Point harbor, and I was requested to examine the locality, and was carried thither in a boat, by persons who had picked up fragments of coal on the beach. I found, however, that the rocks along the coast were, as I had supposed them to be, gneiss, a primary rock, in which coal is never found, and the beach consists of silicious sand, containing mica, and evidently derived from the disintegration of similar rocks. There is no possibility, that coal should be included in such rocks. I have since learned, that a company was formed, in despite of my opinion, and an attempt made to discover coal at Morse's River, half a mile north from this place. Their attempts to find coal, in a situation where Nature never places it, will, of course, prove abortive, and they will learn, after they have idly expended their capital, what a geologist could have told them beforehand, that their researches were absurd. I have analyzed specimens of the coal, which were picked up at this place, and find the chemical composition of it to be very nearly the same as that of the Orrel coal, brought to this country from England. The following are the results obtained:

Orrel Coal.
Spec. gravity, 1,279
Cubic yard, =2158 lbs.

Carbon,	63,4
Volat. matter,	35,3
Oxide of iron alumina,	1,3
	100,0

Coal found at Phipsburg.
Spec. gravity, 1,252
Cubic yard, = 2106 lbs.

Carbon,	63
Volat. matter,	33
Oxide iron and alumina,	4
	100

It will be seen, that there is a close analogy in the composition of these coals, the difference not being greater than it frequently is, in two specimens from the same mine. I have reason to believe, therefore, that the pieces of coal found on Phipsburg beach, are of foreign origin. I had once supposed, that the coal in question, might have been diluvial, but since I made the above analysis, I am strongly disposed to believe that it was derived from the cargo of some ship. It seems strange that, while there has been such eagerness to discover coal in Maine, the most unlikely places have always been selected for such researches.

The gneiss extends from Brunswick to Hallowell, and at the latter place, it becomes exceedingly compact, resembling granite, and is the variety called granite gneiss. It is of this rock that the State House at Augusta is built. It forms an elegant and durable building stone, of a light color, and resembling white marble in appearance. It is largely quarried for architectural purposes, and splits easily into the required forms. It may be distinguished from true granite, by the circumstance, that the mica is in regular layers, shewing that the rock possesses a stratified structure.

Augusta is situated upon an undulating soil, formed of tertiary and diluvial deposits, and owes much of her beautiful scenery to the soft rounded outlines of the hills, through which the Kennebec winds its course. There is no spot in Maine, where the rolling form of the country and the general direction of the valleys, indicate more clearly the passage of a diluvial current over its surface; and we find the rounded masses of stone, which exist mingled in confusion with the clay and sand among the hills, are not of the nature of the rocks below, and in the immediate vicinity. They are mostly pieces of slate rocks, such as occur in place on the north, at Waterville, Vassalboro' and the vicinity. I have not traced

them all to their parent rocks, but have no doubt that it can easily be done. The substratum of clay, on which the diluvium rests, is in regular layers, shewing that it had been deposited tranquilly, while the strata above, exhibit the effects of currents, and are more irregular in their distribution. In many places, the valleys have been cut down to the tertiary beds of clay, to the depth of nearly 200 feet, and any one who looks upon the general direction of these valleys, will feel satisfied, that they were excavated by a current of water. As my time spent at Augusta was short, I could but take a bird's eye view of this interesting deposit.

Leaving Augusta for Bangor, we pass but a few miles, before we come to the talcose and pyritiferous slate rocks, such as I have before described; but here they are more decidedly argillaceous, and their surface is often coated with plumbago. There are also many narrow layers of carbonate of lime or calcareous spar, interposed between the strata, and the rock then assumes a greenish hue. Vassalboro' and China are situated on this rock. Dixmont has a remarkable mountain, rising to a considerable elevation, and said to be 2000 feet above the level of the sea. I clambered up to its summit, and found it composed of regular strata of talcose slate, of a grey color, running E. N. E. and W. S. W., with a dip to the N. N. W. 60°.

At Troy, three miles from Dixmont, I examined a bed of pyrites and pyritiferous slate, which is of considerable importance to the State, as it will furnish an abundance of copperas and alum, the manufacture of which is easy and profitable. I have seen but few localities which afford so good a material as is found here, the pyrites being so perfectly mixed with the slate, that it will readily undergo chemical changes, when heated and moistened with water, in the usual manner. Many absurd speculations have been entertained respecting the nature and value of this locality, some maintaining the pyrites was gold or silver, and others, that the plumbaginous glazing on the slate, was a sure indication of coal.

Argillaceous and talcose slate form the substratum, on which the tertiary soil of Bangor rests. This may be seen at a place called the Lover's Leap, on the Kenduskeag River, and at Brewer, on the opposite side of the Penobscot. At

the latter place, it is so thickly glazed with plumbago, as to have been mistaken for coal, and property has been bonded under this impression. Many absurd speculations of this kind were entered into during the summer before last.

The hills of Bangor are mostly composed of diluvium, resting upon a tertiary deposit of yellow clay, filled with curious fossils, resembling in size and shape, a common Havana cigar; one of the most remarkable localities being the hill on which the Bangor House stands. These fossils are all arranged in perpendicular rows, with the smaller extremities uppermost. They are composed of fragile clay and hydrate of iron, the interior having a small tubular opening extending through it, which is invariably lined with a coating of the latter mineral. These fossils are known to the people under the name of Indian pipes. They bear some analogy to the supposed ovulites, found in similar clay in Massachusetts, but are larger, more regular, and evidently of a different species. Not having any of the perfect ones at hand, I have given in Plate iii., Figs. 27 and 28, some drawings of two broken specimens, which will show their structure.

Leaving Bangor for Ellsworth, we remarked that the rocks were of the same character, as around the former place, until we arrived at Otis, where the gneiss again appears rising from beneath the slate, and runs on to Ellsworth, where it is broken through by a dyke of greenstone trap. This trap forms the subordinate rock at Hancock, and extends to Sullivan, where a very valuable granite rock occurs, and is extensively quarried and shipped to New York. There are few granite rocks equal to this in beauty, its basis consisting of quartz, with a small proportion of felspar and black mica. It splits easily into any form required, and is very valuable for architectural purposes. In the crevices of this rock, I found a very soft, soapy substance, which is composed of silex, magnesia and water, and is a hydrated silicate of magnesia.

Between Sullivan and Steuben, there may be seen trap dykes traversing granite rocks, and from the latter place to Lubec, they occupy the whole tract of country along the road, and probably are continuous to the sea coast, where

we have described them, in the section third. In the middle of the road to Lubec, at Whiting, may be seen the perfectly regular geometrical figures, formed by the extremities of some pentagonal columns of rock, of which they are sections. Large tabular sheets, or pseudo-strata of greenstone, may be seen on the road side, near Lubec; and in many places, masses of slate may be found, converted into hornstone, a rock as hard as flint, proving the influence of fire.

I have now given the different sections, as I proposed, and have only to regret, that neither time nor reasonable limits, will allow me to go farther into details respecting particular phenomena. I feel that I am attempting to compress the geological history of a great country into too narrow limits. The present description is intended as a mere outline, recording the leading facts, which will serve as a key to your mineral resources. I am sensible that the work is very imperfect, and that in a literary point of view, there may be much fault to find, especially with the numerous repetitions. But how could I be true to Nature, if, when she repeats, I did not do so likewise. I only hold the pen; Nature dictates the facts, and I have presumed to put in, here and there, a word of interpretation, which I hope may not come amiss.

ECONOMICAL GEOLOGY.

Although the facts and principles, which lead to a knowledge of the earth's surface, may in a true and philosophical sense, be included under this title, since they serve to guide all scientific explorations of our mineral wealth, yet I shall not extend its meaning beyond the most common apprehension of the subject, and shall define it to signify *an account of those minerals, rocks and soils, which are of pecuniary value*, such as may become useful in the arts of life.

Maine possesses, in an eminent degree, those important resources derived from the mineral kingdom. Her rocks are various, and among them are found many that are useful, either in their natural state, or after being subjected to mechanical or chemical operations. Those rocks, which include within them beds and veins of metallic ores, also abound and have already been found to contain many of those substances, and in sufficient quantities to render their exploration valuable, while there exist indubitable indications of other ores, not yet found in abundance, but which there is reason to believe, may be discovered, by future researches.

Those rocks which are useful in their natural state, and require but little outlay of capital in preparing them for the market, are certainly among the most important resources of the country. They do not, like metallic ores, require much skill in mining, and in the chemical operations of the furnace and laboratory, but demand only the most simple mechanical labor, the profits of which may be at once foreseen.

Granite is an article every where in demand for architectural purposes, and while the Southern and Western States are totally destitute of it, Maine possesses inexhaustible quarries, which are capable of supplying the whole world with building stones of the greatest durability and beauty. The great pyramid of Egypt, which weighs six millions of tons, and has been an object of wonder and admiration, for more than thirty centuries, is built of granite or sienite. It is a monument,

which, since the original design of its builders has been forgotten, may serve at least to demonstrate the imperishable nature of this rock. But what are the Egyptian pyramids in age, magnitude or durability, when compared with those eternal mountains, raised by the hand of Infinite Power, and withstanding from the foundation of the world, the action of the elements?

While on our geological excursion the past summer, we were not called upon to explore all the inland localities which are composed of this rock, the task remaining to be accomplished during future campaigns. We have nevertheless examined in some measure those regions which lie upon the sea-board, and are especially valuable for commercial use. It will be seen, that nearly all the capes and islands, west of Head Harbor Island, are composed of granite and sienite. Mount Desert raises her granite mountains nearly 1800 feet above the sea, and offers inexhaustible quarries. Calais, Buck's Harbor, Gouldsboro', Sullivan, Blue Hill, Sedgwick, one half of Deer Island, the Fox Islands, Isle au Haute, St. George, Friendship, and many other localities, enumerated in the Report, under the head of Topographical Geology, afford abundant quarries of this rock.

Gneiss is a rock also valuable for architecture, and this State has enormous quantities, which are wrought to some extent. Hallowell furnishes an elegant white variety of granite gneiss, which, when smooth hammered, is equal in beauty to white marble. Phipsburg, also supplies a handsome variety of gneiss. The light color of the Hallowell stone, does not happen to be in fashion at this time, but it possesses intrinsic beauty, which will ensure its sale. Gneiss is more suitable for platform and flagg stones than granite, as it splits easily into large sheets, which are in constant demand, and are sold by superficial measure.

Granite veins containing large crystals of felspar are found intersecting gneiss, and abound especially at Brunswick. The felspar of this rock is remarkably pure, and is admirably suited for the manufacture of porcelain or China ware, and it has been used in Boston for making mineral teeth. It is perhaps, not generally known, that this mineral is exported to England from Connecticut to be made into China ware,

and I see no reason why it cannot be wrought to advantage here, wood being cheap and felspar abundant.

Kaolin, or porcelain clay, forms from the decomposition of felspar, and may be found wherever a granite vein is decomposing. At Blue Hill, there is found a mineral, which is formed under these circumstances, and is washed down on the low lands by the rain, and deposited in great quantities in the soil. This substance is composed of silex, alumina, and water, according to analysis, in the following proportions in 100 grains:

Silica, ...	74
Alumina, ...	13
Water, ...	12
Ox. iron, a trace,	—
	99

This mineral is used by mixing it with felspar and porcelain clay, in the manufacture of some hard varieties of porcelain and stone ware. There are numerous other localities of this mineral, in the State, probably in the vicinity of many of the granite hills. I have analyzed some varieties of this mineral, which were so light and spongy, as to have been mistaken for magnesia.

Veins and beds of milk-white quartz also occur in Maine, one of which is mentioned, as forming a mass of great size, at Grant's Point, Machias, where it may be profitably manufactured into flint glass, wood for the supply of the furnace, being abundant. A beautiful variety of granular quartz, white as snow, occurs in beds at Liberty, and in Whitefield. This substance is used by reducing it to fine grains, by heating it in the fire, and then quenching it with water. It is valuable in glass making. The white silicious sand at Great Island, may also be used for a similar purpose. As there are but few localities in the State, which afford such advantages, I have mentioned these, as the most eligible, for this manufacture. The quartz may be prepared for glass making, by heating it to redness and quenching it with water, after which, it grinds easily under the crushing wheel, and on being sifted, is ready to mix with the potash or soda and red lead, to melt into glass. At Sandwich, Mass., profitable glass works are carried on, the sand used for the purpose being obtained from the sea beach. Similar works may be established at Great

Island, it having a beach of white silicious sand, two miles in length.

Greenstone Trap is one of the principal rocks on the coast of Maine, extending from Lubec to Gouldsboro', and presenting abrupt precipices, which rise to the height of from 50 to 200 feet. The columnar form of this rock, renders it suitable for rude Gothic architecture. The soil derived from the disintegration of trap rocks, is of an excellent quality. *Tarras*, a substance used in the manufacture of a variety of hydraulic cement, results from the decomposition of similar rocks. Although the economical uses of trap are not very conspicuous, yet its influence on the rocks in connection with it, is so remarkable, as to render its occurrence sometimes important. It will be observed, that when it cuts through the strata argillo-ferruginous limestone, at Lubec and elsewhere, the rocks at point of contact become metalliferous, and this effect is, I believe, more general, than is commonly apprehended. At Marshall's Island, the vein of iron ore strikes out laterally from a trap dyke. The lead and zinc mines were always found under such circumstances, as to induce the belief that they were produced at the same time the trap was injected. We may also regard the hæmatite, in the slate of Woodstock and Hodgdon, as having been deposited in a fissure in the strata, caused by the upheaving of a dyke which occurs beside it.

But the most remarkable effects, are those which it has produced among the limestone strata. There the physical and chemical qualities of the lime rocks, have undergone changes, and as may be seen, beneficial results have been produced, and the rock is rendered more suitable for the purposes for which it is used. I refer to the localities of Thomaston, Hope, Lubec and L'Etang.

The influence of trap-rocks on slate, is not to be disregarded, the latter being found charged with pyrites, wherever dykes are injected into it. In other places, it converts the slate into jasper, hornstone, or chert. The pyritiferous slate is an article of great economical value, for by a very simple process, it may be made to produce both copperas and alum. Works for this purpose are established on Jewell's Island, and the above mentioned articles, manufactured advantage-

ously. These works having been in operation but a short time, I have not been able to obtain a statistical account of the extent of the manufacture, nor could I learn at what cost the articles are produced, but presume from the increased activity among those engaged, and the opinions expressed concerning the establishment, that they are found to be profitable. Vinalhaven and Troy, near Dixmont, are also eligible localities for similar manufactures, which have come under our inspection.

Argillaceous slate, for roofing, is an article of value, largely imported into our country from Wales, and is far preferable to coverings of zinc, copper and lead, which render the water, falling upon the roof, unfit for domestic purposes. It is therefore a matter of congratulation, that Maine offers an inexhaustible supply of this material, equal in every respect, to any slate yet discovered.

The quarries of Williamsburg may supply our whole Atlantic coast, when we shall be disfranchised from our dependence on the slate quarries of Great Britain. Maine presents the most extensive and valuable slate quarries in the Union, and we may confidently look forward to the day, when the localities on the Penobscot will be wrought advantageously. It will be seen by my remarks, in a former section of the Report, that the Williamsburg and Brownville slate can be brought to Boston, at the cost of only $8 per ton, while we now pay $27 for Welsh slate of similar quality.

Limestone and *Marble* are also among the great resources of Maine, and few manufactures are attended with so little risk and with such certainty of profit, since their preparation for the market is simple, and, the price of wood and lime being given, the amount of labor and cost is easily calculated. The value of marble remains nearly the same, for a great length of time, and an estimate is easily made, by the manufacturer, of the expense required, to polish the rough material. The manufacture of these articles is commonly held in too low esteem, but the influence of such occupations on the character of a people, is far more salutary, than the more hazardous speculations in mines and metallic ores. I doubt if any mines exist, where a larger amount of capital is employed, than the sum annually received from the sales of lime at

Thomaston. There are many improvements to be made in the method of burning lime, and one of these contrivances consists in having lateral arches in which the wood or coal is consumed, while the flame and current of heated air draw through the limestone, and keep it constantly red hot. It is then, when sufficiently burned, drawn out and more rock is to be added to the top of the charge. By this process the kiln is kept continually red hot, and a great amount of fuel saved. There are also other advantages, no time being lost, by waiting for the kiln to cool, and the lime does not become air-slaked. Sufficient has been said in order to induce the lime burners to make some experiments, the advantages of which they will soon experience. I was informed, that anciently, it required three weeks to burn a kiln of lime, but that during a frolic among a party of lime burners, wood was crowded into the arch, and to their great surprise the operation was found to have been completed in the space of three days. The requisite in burning lime, is to bring the whole mass of *carbonate of lime* to a sufficiently high, and uniform temperature, to *expel* its *carbonic acid*. Thomaston stands preeminent above all other places in our country for the manufacture of lime, and her commerce in this article extends along the Atlantic coast to New Orleans and the West Indies. During the present year more than 400,000 casks of lime will be sent forth from her kilns, for which 400,000 dollars will be paid. By the following statistical report, furnished through the kindness of Dr. Cochran, it will be seen how much lime will be burned the present year, the cost of its preparations and profits accruing from its sale. It must be remembered that in addition to the balance of profits, seen by a comparison of the results, a large population is supported by the receipts from their labor, and extensive commercial exchanges are carried on with other States.

A statistical account of the lime business of Thomaston, extracted from Dr. James Cochran's letter.

"THOMASTON.

"The whole quantity of lime manufactured this year, will not vary much from 400,000 casks. In addition to this, the quantity of limerock shipped and burnt in other places may be estimated at 30,000 casks. The cost of burning the whole quantity, $160,000. The quantity of wood required,

40,000 cords, the average cost of which is three dollars per cord. Average value of limecasks this year about 28 cents. Cost of the limestone sold at the kilns 20 cents, which is made up as follows:

Quarrying 7 cents,—rock in the quarry 3 cents,=10 cents.

The average quantity of lime burnt in a kiln, 300 casks. The sales of lime this year, at Thomaston, will not vary much from one dollar per cask.

Recapitulation.

Whole quantity of lime burnt 400,000 casks, and sold at one dollar, . . . $400,000

Rock at the kilns costs 20 cents per cask, .	$80,000
Wood, ...	120,000
Labor in burning, ...	40,000
Casks, at 28 cents each, . . .	112,000
	$352,000

"In regard to the quantity of marble manufactured in Thomaston, from Thomaston stock, the sales are estimated at $9000, according to the best information that could be obtained. There are also considerable quantities of foreign marble manufactured at these works, which it is not thought proper to reckon here, in a statistical view of Thomaston. The principal quarries now worked are, at Blackington's Corner,—the Meadows,—Beach Wood, and the State's Prison. A large portion of the laboring part of the population are engaged more or less in this business, which is annually increasing in a moderate ratio.

"Seven eighths of the lime transported to different markets is carried in Thomaston bottoms, navigated and manned by their own citizens. And it would not be extravagant to say, that there are constantly employed, in carrying lime and bringing wood, at least *one hundred sail.*

"I have taken considerable trouble to collect information relative to the several points on which you wished to be informed. It is extremely difficult to arrive at accuracy."

Pure carbonate of lime contains 43,7 per cent. of carbonic acid, and 56,3 of lime, and when thoroughly burned the carbonic acid is entirely expelled, and the lime remains.

Dolomite is a magnesian limestone, containing, when pure, 43,7 per cent. of carbonate of magnesia, which replaces an equivalent proportion of carbonate of lime.

Among the ordinary limestones, there are mechanical mixtures of these ingredients, in variable proportions, with other substances, derived from the accompanying rocks.

The limestones of Thomaston, Camden, Hope, Lubec, Machias, L'Etang, &c. are thus found to contain certain impurities, the nature and proportions of which, could only be ascertained by chemical examination, the results of which analyses I have given in a tabular form below.

Name of Locality. and variety of rock.	Spe. grav. water being 1.000	Carb. Lime in 100 grs.	Carb. Mag. in 100 grs.	Carb. Iron in 100 grs.	Silica in 100 grains.	Alumina in 100 grs.	Carbon in 100 grains.	Water in 100 grains.	Lime contained pr. 100.
Thomaston. J. Ulmer's quarry. Grey.	2.7206	98.00	0.44	0.60	0.20		0.40	0.36	54.50
Thomaston, E. Ulmer's. Bluish and white.	2.7080	98.20	0.84	0.12	0.30	0.10	0.04	0.40	54.51
Rhomb. Spar of E. Ulmer's quarry, Thomaston.	2.7170	83.36	15.50	0.40	0.40			0.34	47.00
Marsh Q. Dolomite. Cochran's quarry, Thomaston		52.80	43.20	1.60	1.20			1.20	21.1 21 Mag.
Camden, Lilly Pond. Grey and white.	2.772	90.00	Magne. 2.00		4.00	2.00		2.00	50.00
Hope, Pierce quar Compact with grey stripes.		99.00		0.10	0.40	0.30	0.10	0.10	5.48
L'Etang. Slate colored.	2.733	98.00		0.20	0.80	0.20	0.30	0.50	54.30
Brunswick white saccharoidal. Jordan's Quarry.		99.60			0.40				55.06
Starboard's Creek, Spotted semi cryst.		83.20	Carb. of Mang. 11.20		5.60				46.60
Lubec. Comstock's Point. Bluish grey		85.00		3.00	3.10	8.00	Bitum. 0.50	0.50	47.80

Thomaston furnishes a number of beautiful varieties of marble, which are generally clouded with grey and blue colors, derived chiefly from the graphite, argillaceous and ferruginous matters, which it contains. Small crystals of

pyrites, or sulphuret of iron are sometimes disseminated through its mass. This substance does no injury, to the marble, unless it is exposed to air and moisture, when it decomposes, leaving long white and brown streaks of sulphate of lime and oxide of iron, on its surface, which deface its beauty, examples of which may be seen in the grave yard of Thomaston. Care should be taken that this substance should not be contained in blocks, intended to be wrought into monuments, exposed to the weather. The *dolomite* found at the Marsh Quarry can be wrought into a variety of marble of a white color shaded with grey. This quarry will, doubtless, also supply large blocks, suitable for statuary. Many of the antique statues of Greece and Rome, were sculptured from this species of rock. It may also be quarried largely for building stones, the beauty of which, is equal to any white marble, wrought for this purpose.

Hope and *Camden* are also capable of yielding an abundance of handsome marbles, but no attempt has yet been made to introduce them into the market. The following statistical information, respecting the lime business of Hope and Lincolnville, we have received from Mr. Pierce, of Belfast, contained in a letter to Dr. Purrington.

"The amount of lime hauled to Duck Trap and French's Beach, from Sept. 1835 to Sept. 1836, is 61,609 casks. You may rely upon the accuracy of this statement, as I had it from the wharf books."

"The whole amount of lime burned for the last year in Lincolnville, is 100,000 casks."

"The amount burnt in Hope, at Mr. Pierce's quarries, is 5,000 casks. He has opened his quarries in three other places, and that lime is furnished is of the best quality and burns hard. This quarry has an advantage over those of Thomaston and Camden. There the wood is worth $3 per cord, and it takes 10 cords to burn 100 casks of lime, making the cost for wood $30. While at Hope, wood is worth only 75 cents per cord, making a saving on the wood of $22,50. The hauling, however, I suppose, will about counterbalance this advantage."

The following statistical information we obtained through the kindness of Mr. Carlton, of Goose River, while we were exploring the quarries at that place. From 30 to 40,000 casks of lime were shipped from thence, during the past year.

Twenty-one kilns for burning lime, are kept in operation at that place. Six schooners, carrying 550 casks of lime each, and twelve brigs, taking each 2,000 casks, have sailed from Goose River, besides which, occasional vessels take in a partial cargo of lime. About as much is annually exported from Camden. This lime sells for 87½ cents per cask at the kiln. Wood costs from $2,50 to $3,00 per cord, and from 22 to 23 cords are required to burn a kiln of 300 casks of lime. The time required for burning is three days and nights.

Besides this amount of lime, a large quantity of the rock in its natural state, is exported from the Beauchamp pits, situated near the sea shore, upon the point below the village of Goose River. This rock is afforded for 14 cents, while that of Thomaston brings 20 cents per cask. Mr. Carlton also states, that the Camden limestone requires one cord less wood per kiln than that of Thomaston. The measure of a lime cask, is fixed by law at 40 gallons, and they hold 300 pounds of lime. The following measurements were made of a kiln, said to be capable of burning 300 casks of lime. It was fourteen feet long, fourteen feet high, and five feet deep. It has three pointed arches, that in the centre being five feet high. The kiln is built of talcose slate, a rock found in abundance in the vicinity.

From the statistical facts, which I have laid before you, it will appear that nearly 700,000 casks of lime are annually exported from the quarries enumerated, the whole profits from the sale of which, are received by the citizens of Maine, while a wholesome industry is cultivated by the operatives. It is evident, that all the property thus brought forth, is actually *produced* from materials, which nature has distributed through the State with a bountiful hand, and which cost only the labor of preparing them for the market. Already, then, your commerce in lime, is worth more than the whole proceeds, from the gold regions of the Southern States, while the moral advantages of a sure business, over that of a more hazardous nature, are not to be overlooked.

Many of the limestones, of an argillaceous nature, such as are found abundantly around Lubec, and along the shores of the St. John's River, on the public lands, may be converted into hydraulic cement, a substance which is

imported for the construction of subaqueous works, and is also manufactured from a similar rock in the State of New York, and in Canada. This substance is used extensively in the construction of canals and aqueducts, also in the formation of artificial reservoirs for water, and in the manufacture of an artificial sandstone. From an analysis which I have made of the New York Parker's Cement, the following was found to be its chemical composition.

Lime, ...	33,00
Alumina ox. iron and manganese, .	39,00
Silica, ...	10,00
Water, ...	1,00
Carbonic acid, ...	17,00
	100,00 gr.

The Lubec limestone contains the same ingredients, and may doubtless be manufactured into a similar cement.

Hydraulic Cement Stone. The green marble of Starboard's Creek, and that from the point of Maine, in Machias, will become of considerable commercial value, since they may be converted into hydraulic cement, by a very simple operation. The extent of this rock may be seen in the Topographical department of this Report.

I made a chemical analysis of a specimen from Starboard's Creek, and obtained the following results. One hundred grains of the stone yield,

Carbonate of Lime, ...	59,5
Carbonate of Iron, ...	6,0
Silica, ...	14,0
Alumina, ...	15,0
Oxide of Manganese, ...	4,0
Water, ...	1,5
	100,0

New Red Sandstone, or freestone, is also found in Maine, along the St. Croix River, forming high cliffs, skirting the river, from Pleasant Point to Robbinston. This locality offers some varieties which may be advantageously quarried for building stones, while its quantity is inexhaustible. The

finer varieties are in demand for grinding the surface of marble, and for casements to windows. A very compact kind of sandstone is also found at Nutter's Head, which makes excellent hones for fine tools, said, by those who have used them, to be superior to the Turkey oilstone. Sufficient quantities may be obtained for this purpose, and even for the manufacture of grindstones, if required. The sandstone cliffs of Perry, have already attracted attention, and will doubtless be quarried for freestone. While quarrying the sandstone rocks, the remains of plants found in it, ought to be preserved for examination, since they bear an important relation to the coal formation. The soil, derived from the decomposition of this rock, is of a red color, which, at Perry, is found to be genial to grain. It is there mixed with decomposed trap-rocks, the detritus from the two rocks uniting to compose an excellent soil.

Soapstone, or talcose rock, is found at Harpswell, Orr's Island, and at Jaquish, and has been wrought at one or two places. It is difficult to work, but is very durable, withstanding the action of fire. The bed at Orr's Island is fourteen feet wide, and may furnish a considerable supply of this material.

Peat occurs abundantly on many lowlands in the State, and may become an article of value, as the price of wood increases.

Marl is common beneath the peat bogs, and being charged with vegetable juices, is admirably suited for a manure.

Plastic Clay is also abundant, and is used in the manufacture of bricks. On the public lands at Madawaska, it occurs in high banks along the river side, and overlies beds of iron ore and green sand, the latter being valuable, when mixed with lime, for the purpose of amending soils, while the clay may be used, for the manufacture above mentioned, and for earthern ware. Bangor and Augusta, are abundantly supplied with this substance, and it is found in the vicinity of almost every town.

Beds of clay serve to intercept the passage of water, and give rise to those accumulations of this liquid, which burst

out on the hill sides, in the form of springs, or are perforated in excavating wells, or by the artesian auger. Hence, their disposition, dip, and direction should be carefully noted, on the site or environs of large towns and cities, since they are valuable reservoirs, which may become of importance to those places.

Metallic ores have always attracted more attention than the most useful rocks. Some of them deserve this preference, since they furnish the most valuable implements, which are in the possession of man. Gold has commonly been considered the king of metals, but it is evident that *iron* is far more worthy of this distinction. It is exclusively in the hands of civilized man, and is the strong arm of national industry. Let us examine then, and see if Maine possesses this valuable substance, in sufficient abundance to make it available in the arts. Only a comparatively small portion of the State has yet been explored, but we have every reason to feel encouraged by our success. Several valuable localities have already been discovered, and rock formations in which there is every reason to believe, more extensive beds of iron ore exist, have been described.

The richest ores we have found, have been of the magnetic species, the localities of which are given in the preceding division of my Report.

On Mt. Desert, at Bass Harbor, numerous small veins occur, none of them being more than eight inches wide, while they are included in a very hard trap-rock, and are difficult to extract. A number of narrow veins were found in the red sienite, near that place; hence there is reason to believe, that there are more powerful veins, which will be brought to light, when the Island is farther explored.

Black's Island, in the vicinity, affords a rich variety of *hydrated oxide of iron*, which will yield 40 per cent. of metal. I learned that upwards of 20 tons of this ore had been carried from that place, and about the same quantity from the magnetic veins of Mt. Desert.

The largest vein of *magnetic iron ore* which we have examined, is situate on Marshall's Island, where it is found included between walls of granite, with a trap dyke by its side. This vein averages three feet in width, and forty feet

in length. The ore is of the most compact variety of magnetic oxide, of the species called by Berzelius, *the oxide ferroso ferricum*, and contains 72 per cent. of iron, and 28 of oxygen. Its specific gravity is 4.8, calculating from which, a cubic foot should weigh 300 pounds, which will contain 216 pounds of iron.

If we allow, that this vein is wrought, only to the depth of 100 feet, its cubic contents will be $40 \times 3, \times 100 = 12,000$ cubic feet of ore, each foot of which weighing 300 pounds, will give $12,000 \times 300 = 3,600,000$ pounds of ore in the vein at this depth, which will yield 324,000 pounds of *iron*. Other veins are said to occur on this island, but we had not time to visit them. The ore may be smelted on the spot, or carried to some more favorable situation. The latter expedient, I should think most advisable. It may be advantageously mixed with the lighter bog iron ores, and then it will not overload the furnace. The only flux required, is limestone, and charcoal may be used for its reduction in the blast furnace, if soft cast iron is required; but if it is to be wrought into *bar iron*, it may at once be manufactured, at much less expense, in the bloomery forge, little capital being required for such works.

Specular iron ores are found in the porphyry rocks of Seward's Neck, but they are not of sufficient width to pay for the expense of extracting them, the widest not being more than ten inches. This ore is evidently a product of sublimation, for all the vertical crevices in the porphyry are filled with it, and their surfaces are spangled with its brilliant crystals. From chemical analysis, I find this ore to contain,

Per oxide of iron, ...	89
Oxide of titanium, ...	11
	100

It will yield 63 per cent. of iron.

Titanium, in so large proportions, would render the ore difficult of reduction, even if it were found in abundance, such ores being rejected in the furnaces of Sweden, on this account.

Specimens of magnetic iron ore have been sent me from the vicinity of Bath, and are supposed to have been obtained

from the mica slate rocks of Georgetown, near that place. The ore is granular, and disseminated in a manganesian mica-slate. The specific gravity of the mass of rock, containing the iron ore, is 3,41. By chemical analysis, an average specimen was found to yield

Per oxide of iron, ...	16,0
Oxide titanium, ...	5,4
Oxide manganese, ...	8,0
Insoluble earthy matter, . . .	70,0
	99,4

I am not aware that any considerable quantity of this ore has been found, or that veins have been discovered.

Many places in the State furnish abundant supplies of *bog iron ore*, and they may be wrought to advantage, wherever a sufficient supply can be obtained, to keep a blast furnace in operation. This ore is constantly forming from the decomposition of iron pyrites, existing so abundantly in the slate rocks of Maine, and is transported by water to the surrounding lowlands, where it is deposited in the state of a red or brown powder, which concretes into solid masses. I have explored the topography of but few localities of this ore, they occurring principally in the interior of the State.

The largest and most important bed of *iron ore* is found on the boundary line between the British Provinces, New Brunswick, and Maine, at Woodstock. This bed probably traverses our territory, cutting through the township of Hodgdon, and running through an unknown extent of country. This bed is said to be nearly 900 feet wide, and its length is unknown! The ore is the compact red *hæmatite*, and will yield 44 per cent. of pure metallic *iron*, and 50 per cent. of cast iron. Allowing its specific gravity to be 3.5, and some of it will range still higher, a cubic foot of the ore will weigh 200 pounds. If the ore were wrought to the depth of 100 feet, and 500 feet in length, we should have for the cubic contents, $900 \times 100, \times 500 = 45{,}000{,}000$ cubic feet of ore. Every cubic foot yielding 50 per cent. of cast iron, we should have 225,000,000 pounds as the amount of cast iron that can be wrought from this bed, within these narrow limits. The amount of iron that this locality may furnish is almost incal-

culable, as it is evident that the bed may be opened to a great distance, and the supply will be inexhaustible. This locality, should the St. John River be ultimately obtained for our N. E. Boundary, would furnish an abundance of ore to commerce; at all events, it is a locality of national importance, situated, as it is, in the immediate vicinity of one of our military frontier posts, at Houlton, and capable of being wrought for the manufacture of cannon and other arms, which we have now to transport from a distance.

Lead and *zinc ores* are found in various parts of Maine, but we have only had the opportunity of exploring with care the mines in the neighborhood of Lubec. There three veins have been wrought, and have yielded sufficient lead to encourage the proprietors, so that the works will be resumed. Many other localities of lead were also discovered in the vicinity, indicating that there may be other and larger veins. The rock in which they are found is the well known metalliferous limestone.

Sulphuret of zinc is also found at the same place, and will hereafter be wrought for zinc. Copper pyrites is also found at Lubec, and will become an article of value, to be selected from the other ores, when the mines are wrought. The Lubec ores yield, when pure, 83 per cent. of lead, the remainder being sulphur and a little silver, not worth separating.

The ores taken *en masse*, will yield 60 per cent. of lead. The following results were obtained by analysis, of this ore. 100 grains contain

Lead,	83,000
Sulphur,	15,000
Zinc and copper,	1,800
Silver,	0,010
	99,810

Indications of Tin.

I received, about a year since, some specimens of rocks and minerals from *Blue Hill*, Maine, for examination, and among them found a specimen of *wolfram*, or ferruginous oxide of tungsten. This mineral, which I analyzed, was

found to be identical with the ore *wolfram*, found in all *tin mines* of Europe, and is considered an indication of that metal. It consists, in 100 grains, of

Tungstic acid, ...	77
Ox. Iron, ...	17
Ox. Manganese, ...	6
	100

Its occurrence in the granite rocks of Maine, would lead us to anticipate the discovery of tin in that district. I have not yet, however, been able to explore the locality. *Tin ores* have so little the appearance of a metal, that they are generally overlooked by persons unacquainted with mineralogy, and I believe this is one reason why they have not yet been found in our country.

They have a deep brownish, or rusty red color, are hard, compact, heavy and resemble the red oxide of titanium, more than any other mineral. Tin ores are found disseminated in the granite rocks of Cornwall, and in veins in the same kind of rock in Bohemia. The soil, derived from the decomposition of these rocks, in Europe also contains an abundance of this ore, scattered through it, which is separated, by washing the soil, by means of a current of water.

Black oxide of Manganese is a substance used in the manufacture of chloride of lime, or bleaching powder, and when found in quantity, is a valuable article in commerce. This mineral we have found at Hodgdon and at Woodstock, near Houlton, encrusting the slate rocks, which contain iron ore. It is also found at Thomaston, in the state of black, rounded and irregular concretions, on the surface of a hill, three miles northwest from the port of East Thomaston. It has there been frequently mistaken for coal, and has, on that account, attracted considerable attention. There are many other localities in the State, where this mineral occurs, in small quantities, but none have yet been found to be sufficiently important to supply the market. From its frequent occurrence, there is reason to believe that it may yet be discovered in more powerful beds. I understand that this article is now worth $30 per ton, in its crude state, and it is brought to Boston from Bennington, Vermont, and from

Quaco, New Brunswick. Considerable quantities are also imported from England. The Quaco manganese, comes to us in very solid masses of a rounded form, having a grey color internally, and a fibrous structure. The Thomaston manganese possesses this advantage ; since it is in a less coherent state, it may the more readily be reduced to powder, than other varieties of this ore.

Iron pyrites, or sulphuret of iron, abounds in Maine, and may be used in the manufacture of copperas, when it occurs in veins; and when mixed with slate, it may be used, also, in the manufacture of alum. Pyrites, or bisulphuret of iron, contains, in one hundred grains,

Sulphur, ...	54
Iron, ...	46
	100

The sulphur, contained in this mineral, is capable of being extracted, and should ever any obstruction to commerce, prevent our obtaining it from the volcanic districts, which now furnish a supply, we can then resort to this mineral, which will afford an abundance of that indispensable article. It is always a satisfaction to know, that we have all the necessary munitions of war, within our domains, and although the present low price of sulphur will not warrant the expense of extracting it from pyrites, yet if a general war should at any time take place, and our ships were to be excluded from the Mediterranean, the demand would instantly bring this ore into requisition.

Arsenical iron is found in Maine, in the form of veins, which traverse the trap and granite rocks. At Thomaston, near Owl's Head, and at Lubec, this mineral is found in veins of quartz, associated with galena, or sulphuret of lead. It is not of much value, all the arsenic at present used, being obtained cheaply from the mines of Germany. This mineral contains,

Arsenic, ...	54,55
Iron, ...	45,45
	100,00

Arseneous acid, or white oxide of arsenic, is obtained simply by subliming the arsenic from this ore. It is used in

pharmacy, and in the preparation of orpiment realger, Scheels, green and various other colors. It also enters into the composition of several kinds of glass and enamel, and is used in the manufacture of leaden bird shot, to cause the lead to separate into rounded forms, as it falls through sieves in shot towers.

Copper ores have, thus far, been found only in small quantities, in Maine, the copper pyrites and carbonate of copper, being the only ores of this metal which we have discovered, and these are in too small veins to be wrought advantageously. The copper pyrites is a bisulphuret of copper and iron, and contains in 100 grains,

Copper,	32
Iron,	30
Sulphur,	36
	98

Rarely more than 20 per cent. of the copper is obtained, by the processes of reduction in the furnace.

Native Gold.

While engaged in drawing up the present Report, I received a minute specimen from Professor Cleaveland, of Bowdoin College, with a request that I should subject it to chemical examination. The specimen was discovered by this gentleman, while examining an iron ore, which was brought to him for analysis.

The specimen sent to me did not weigh more than half a grain, and consisted of delicate particles of malleable gold, arranged in irregular diverging branches, connected intimately with a brown ore of iron. From its structure and mineralogical associations, I was satisfied that it was native gold. I took one half of the specimen and submitted it to chemical analysis. Nitric acid alone dissolved the iron and a portion of the silver, and left the gold undissolved. On adding a few drops of muriatic acid, the gold dissolved and a precipitate of chloride of silver subsided. The solution being tested by means of proto-sulphate of iron, metallic gold precipitated, which was collected and melted into a globule, by means of the blow-pipe.

This mineral is then a native alloy of gold and silver, the former metal greatly predominating. Since making this analysis, I have learned from Professor Cleaveland, that the ore was found in Albion, in Maine, and he observes, that "he has no reason to doubt the accuracy of this information."*

From the foregoing estimates, it will appear, that the ores of iron and lead, are among the present known metallic ores, which may be wrought to immediate advantage, in Maine, and I have not the least doubt that they will soon engage the enterprise and capital of her citizens.

Already have companies been formed in Boston and New York, for the purpose of entering upon such operations within your territories, and if skilful in their work, they will not only derive advantage to themselves, but will also bring valuable commercial business into the State. The manufacture of copperas and alum, is also attended with advantageous results, and the people of Maine will soon learn to prize their abundant localities of the minerals useful for this purpose.

Numerous inquiries and speculations have been made respecting the occurrence of coal within the limits of Maine. This question cannot yet be satisfactorily answered, but I may safely say, that there is no geological impossibility of the occurrence of this valuable combustible, along the region between the St. Croix and Pembroke. If any coal is found there, it will be of the bituminous kind. I may also remark, that the slate extending from the Penobscot to the Kennebec, belongs to the transition series of rocks, and alternates with grau-wacke; and although I have explored but a comparatively small portion of this district, I am of opinion, that anthracite may possibly be found in these rocks. If it be true, that arborescent ferns are found in the vicinity of Waterville, as has been stated by a writer in one of the Bangor papers, then there is still greater probability of the

* Since the above remarks were in press, I have been informed, that there is a mystery hanging over the Albion gold, and that gentlemen from that place, are of opinion, that the specimen sent to Professor Cleaveland was of *foreign origin.* I would therefore advise those who are interested to look carefully into the evidence.

occurrence of coal in that section.* I have not yet, however, seen the specimens said to have been found there. Many reports of the discovery of this kind of coal have been circulated, but so far as I have examined, they are without foundation.

In the mean time, I beg leave to request those persons, who feel interested in this subject, to examine the argillaceous slate and grau-wacke rocks of their several districts, in order to ascertain whether they contain vegetable impressions. If, on splitting open the layers of slate, there are found impressions of fern leaves and other plants of like species, then there is some probability in the conjecture, that those regions belong to the regular coal series; and search for a bed of coal may be made, by traversing the strata of rocks, at right angles, to their direction. Since the dip of these rocks in Maine, is generally very bold, there is no necessity of excavating or boring into them, when they can be found outcropping at the surface of the earth. It happens commonly, that in the immediate vicinity of a coal bed, the soil is deep and the rocks are covered, so that it will become necessary to sink pits through the soil to the surface of the rock, and before reaching it, an abundance of black earth or fine coal will be found in the soil. I have thought proper to make the above suggestions, in order that time, trouble and expense may be saved to the citizens of the State, who may engage in such explorations; my duty being as much to direct the researches of others, as to make them myself, and it will give me great pleasure to learn that good results follow from these remarks.

Black tourmaline, found in granite rocks, is too often mistaken for an indication of coal, whereas, it most assuredly indicates that no such substance will be found there. Granite, gneiss, mica-slate, and trap-rocks, never contain beds of coal, for they are all rocks that have undergone igneous action, or

* I have been since informed by my scientific friend, Dr. E. Holmes, of Winthrop, that he has obtained an abundance of impressions of ferns from the slate rocks of Waterville, and that specimens are deposited in the College Cabinet at that place.

Mr. T. H. Perry, in his letter to me, describes one of these ferns as follows:—

"The top was curved in a manner resembling that of young brakes a few inches high. I *think it must have been* a young fern."

have been subjected to intense heat, since their deposition; so that the only carbonaceous substance found in them, is graphite, or plumbago.

Soils are derived from the disintegration and decomposition of rocks, and there is usually an admixture of decayed vegetable matter on the upper surface, which adds much to their warmth and fertility.

There are various kinds of soil found in the State of Maine, some of which are the immediate results from the decay of rocks in place, while others have been transported from a distance, by the action of running water. Where a soil is derived directly from the rocks in place, every stage of its passage may be observed. From the solid rock, we trace small fragments which have been shivered by the action of frost, or by the agency of the atmosphere and water, have undergone decomposition, it being converted into a perfectly fine soil, in which it is difficult to recognize the materials from which it is derived.

In soils resulting from the decomposition of granite or gneiss, we discover particles of quartz, and brilliant scales of mica, while the felspar is observed in the form of opaque earthy looking grains, of a white color.

Slate rocks form a blue soil, full of small fragments of the rock, which are easily distinguished.

Argillo-ferruginous limestone forms a light yellow soil, and is generally penetrated by rootlets of plants, to a considerable distance from the surface. This soil is luxuriant, and is preferred to all others for the cultivation of wheat, barley, and the grasses.

Greenstone trap decomposing, produces a brown colored soil, remarkably warm and luxuriant. In Maine and Nova Scotia, it is found to be the best soil for potatoes.

New red sandstone, when disintegrated, forms a red sandy soil, containing particles of mica. Alone, it is not considered fertile, but when mixed with the trap-rock soil, it is very good. Specimens illustrating the origin of soils, are deposited in the collection, which I have prepared for the State.

Besides the soil formed from rocks in place, we have the transported soils, which are those that have been removed by running water. Alluvium is produced by the

of rain, springs and rivers, upon the loose materials found on the hills and mountains, which materials are carried by running water to the plains, and are deposited along river courses, especially during freshets. Soils of this character are composed of fine particles of rocks, which are deposited in the state of mud, mixed with a small quantity of vegetable mould. They are well known as the most luxuriant and valuable of soils, and form the rich bottoms of meadows, and the low banks of rivers. Their fertility depends upon the fineness of the transported materials, and upon the due admixture of the several mineral substances, which they contain. Where alluvial soil is formed entirely from slate rocks, it consists of a tough blue clay, which, alone, is not genial to vegetation. Where it is deposited by a rapid current, the particles are of a coarser nature. A mountain torrent leaves only heavy stones in its course, while the smaller fragments are carried to a greater distance, and deposited exactly in the ratio of their smallness, at a distance from the parent bed. Where a rapid stream carries down the detritus of granite rocks, it will leave only large stones and grains of quartz on its way, the lighter particles being carried down the stream and deposited where its current is less rapid. During freshets, rivers overflow their banks, and spread out over the country, and not being confined to their narrow channels, their rapidity is diminished, so that they deposit as they go, an abundance of rich loam, brought down by the river. It is thus, that the Nile, Ganges, Mississippi, and Ohio enrich their banks annually with new soil. The Penobscot, Aroostic, and Meduxnekeag, in Maine, also deposit a deep alluvium on their banks, which, were the climate as temperate, would equal in fertility, the richest alluvial tracts of the Western States.

Few regions in the world can boast of more extensive and well watered alluvial districts than are found in Maine. At present public attention is chiefly turned to the heavy timber, which covers the soil along the banks of these rivers, but there can be no doubt, that the soil itself is worth vastly more than the timber, and will be of many thousand times more real value in the course of its agricultural improvement. Houlton, and the region extending through the public lands, along the

Aroostic, and down the branches of the Mattawamkeag, and Penobscot, are the richest agricultural sections in Maine, much of the soil being alluvial, while even the diluvium there, is made up of the debris of limestone, the whole forming a rich and deep soil.

The currents of rivers and torrents, transport fragments of rocks to a considerable distance, and some modern geologists suppose, that they are able thus to account for the dispersion of all erratic blocks of stone, which are scattered over the country, far from their parent beds. From the evidence which I have been able to collect in various parts of our country, I feel no hesitation in saying, that the course, in which these erratic boulders are scattered, is far too uniform to have resulted from local and partial currents, like those of torrents or rivers. All the observations that have been made, tend to prove that a current of water has swept over the surface of the Globe, since the consolidation of all the rock formations, and the deposition of the tertiary marls and clay, and that the current swept along with it, the loose masses of stone and gravel and sand, carrying them from the north or north west toward the south or south east. Thus was formed the accumulation of rounded masses of stones and gravel and clay, which constitute what is called by geologists, diluvial soil. It is supposed that this rushing of water over the land, took place during the last grand deluge, accounts of which have been handed down by tradition, and are preserved in the archives of all people. Although it is commonly supposed that the deluge was intended solely for the punishment of the corrupt antediluvians, it is not improbable that the descendants of Noah, reap many advantages from its influence, since the various soils underwent modifications and admixtures, which rendered them better adapted to the wants of man. May not the hand of Benevolence be seen working, even amid the waters of the deluge?

Diluvial soils are common in Maine, and are in many places very deep, and bear on their surface, an abundant growth of forest trees. I have already described some of the most remarkable localities—the Horsebacks around Houlton, and the rounded hills of Augusta.

There are too many localities to admit of particular

description, almost every town presenting examples of this formation. It should be remembered the diluvial soils and rocks may generally be traced to their parent beds, north or north-west from the place where they occur; and by a series of observations on the surface of our immense continent, I doubt not that the limits of diluvial transportation may be ascertained, since there are extensive tracts of one kind of rock, bounded by an equal extent of another, and the transported masses may be referred at once, to their parent rocks. I suggest this subject to those geologists, who are now engaged in geological surveys of the various States, since it has a very important bearing on the history of soils.

Agriculturists will perceive, on examining their farms, that it often happens that the rocks found there, are strangers to the place, and on closer examination, they find that they can be identified with rocks farther north. Now soils would be carried to much greater distances, and it would be interesting to know how far the various sedimentary substances were transported.

Mineral Springs.

Wherever pyrites decomposes in a limestone rock, the water, which percolates among the strata, dissolves a considerable quantity of the carbonates of lime and iron, which are dissolved by an excess of carbonic acid, and exist in the state of bicarbonates in the water. Springs of this character are common in Maine, and will hereafter become valuable as places of resort for invalids, such chalybeate waters being generally found salutary in appropriate cases. At Lubec, near the saline spring, which I shall proceed to describe, there exists a chalybeate spring of the above description, which, according to the opinion of Mr. S. Thayer, is a remarkably powerful tonic.

Saline Spring at Lubec.

The saline spring at Lubec is the most important mineral water yet found in the State. It bursts out from the soil near the junction of the red sandstone and blue limestone rocks, and its occurrence there is an evidence in favor of the character, which I have ascribed to the rock formations in question.

The *origin* of salt springs is yet an unsettled question, some maintaining that the salt is formed in the sandstone rocks, by an unknown chemical law, while others are disposed to consider them as produced by the solution of beds of rock-salt contained in the earth. In Europe the latter is most assuredly the case, but the origin of the waters of Salina, in New York, and those on the Kenawha River, in Virginia, has not yet been satisfactorily determined. Whatever may be the result of farther investigation respecting this question, it is at least determined, that saline springs are always found coming from below the new red sandstone rocks, and frequently from the subjacent limestone. On the Kenawha they occur, associated with beds of bituminous coal of great value.*

Salt springs are found in Nova Scotia, in similar geological situations, and in the vicinity of the Pictou coal. Hence there is some geological probability of such deposits occurring in the State of Maine. I have not time to enter fully into the discussion of this question at present, but shall wait for more light to be obtained in our future researches. The spring above mentioned is found on the shores of a creek, at the head of South Bay, near Lubec. It breaks through a bed of tough blue clay, near the side of the creek, and the water rushes from it in a stream as large as a man's arm. Mr. Thayer, who has examined it more carefully than we were able in our short excursion, says that about four hogsheads per hour are discharged by it, and the water is said never to fail. Through the kindness of this gentleman, we were furnished with a quantity of this water, which I submitted to chemical analysis. The following are the results.

ANALYSIS.

It is clear and colorless, specific gravity 1,025.

a It slightly reddens the color of litmus paper, but after being boiled, does not exert this reaction.

b Tested by means of oxalate of ammonia, a precipitate of oxalate of lime takes place.

* See Dr. Hildreth's Essay on this subject, Amer. Jour. Science, vol. xxix.

c Acetate of barytes, gives a white precipitate of sulphate.

d Nitrate of silver, gives a dense and very abundant precipitate of chloride of silver.

e Acetate of lead, gives a white precipitate of sulphate of lead.

f Ferro-cyanate of potash, gives a blue precipitate.

g Solution of boiling carbonate of soda, gives an abundant precipitate of carbonate of magnesia.

h Lime water gives a precipitate of carbonate of lime.

Hence the water contains:—

a h Carbonic acid gas.

b Lime.

c e A sulphate.

d Soluble chlorides.

f A salt of iron.

g A salt of magnesia.

An imperial pint of this water was evaporated to dryness, and 322.5 grains of saline matter was obtained. By calculation from its specific gravity, it should have given only 310 grains, but calculations of this kind are only approximate. One thousand grains of this water, when treated with a boiling solution of potash, give a bulky precipitate of carbonate of magnesia, which, when dried and heated to redness in a platina capsule, weighs 3.5 grains = 30.63 grains to the pint of water, or half an ounce of carbonate of magnesia, to the gallon of water.

100 grains of the dry salt above obtained, submitted to analysis, gave:—

	grs.		Or in a pint of the water, *grs.*
Chloride of sodium,	64.0	- - -	199.000
Sulphate of lime,	3.6	- - -	11.210
Chloride of magnesium,	20.2	- - -	62.845
Sulphate of soda,	9.0	- - -	27.985
Carbonate of iron,	0.8	- - -	2.490
Carbonate of lime,	2.0	- - -	6.250
Chloride of calcium, a trace,			12.720 loss
Carbonic acid gas,			
			322.500
	99.6		
	.4 loss		
	100.0		

The saline contents of this water may be obtained either by the processes of freezing, evaporation or boiling.

Carbonate of magnesia may be largely manufactured so as to afford an abundant supply, and the sulphate of soda may be obtained by freezing the water, in cold weather, so as to concentrate the solution, by the removal of fresh water in the state of ice. I have obtained this salt in large and beautiful crystals, by this process, and after they have been removed, the bittern may be made to yield an abundance of carbonate of magnesia. I consider this spring one of the valuable resources of the district in which it is found, and other springs of the kind should be sought for along the line between the new red sandstone and limestone.

The spring may become valuable for the manufacture of chloride of sodium, or common salt, sulphate of soda or Glauber's salts, carbonate of magnesia and sulphate of magnesia, or Epsom salts.

Sea Water.

There are few if any salt works on the sea coast of the State, and I beg leave to remind you that they may be established advantageously, since by the process of freezing, a large proportion of the fresh water may be removed in the state of ice, while the brine is concentrated and will yield crystals of salt. This process may be pursued in winter, while in summer the usual processes, by solar evaporation, or boiling, may be resorted to. The former of these processes is carried on successfully on the coasts of Norway and Sweden, while the latter are generally adopted on Cape Cod, and many other parts of the world.

Nitrate of potash, or saltpetre forms but slowly in the soil of northern countries, but its formation may be hastened artificially, by means of certain processes, well known and pursued in Germany and Sweden. Nitre, forms in the soil, beneath dwelling-houses and stables, where animal matter is undergoing slow decomposition; a similar process may be hastened by means of nitre beds, which are formed by throwing into a pit animal matters mixed with lime or old mortar. In the course of time, there is formed an abundance of nitrate of lime, which, on being treated with

lye of wood ashes, or a solution of carbonate of potash, exchanges elements, and nitrate of potash is formed, and carbonate of lime is deposited. The nitre is then dissolved, crystallized, and purified. I mention this process, to remind you, that Maine can produce her own saltpetre, but I do not know whether the manufacture would at present be profitable, since we are largely supplied by our commerce with the East Indies.

Water.

In a complete geological work, water as a mineral, should find its place, since it plays a conspicuous part in the geological history of our planet, but it would require more time than we have at present, to enter fully upon this task. I shall, therefore, only remark in general, that no country on the face of the globe is more freely supplied with water than Maine. Her lakes are innumerable, while the whole surface of the State presents meandering rivers, which irrigate the soil, and carry health and abundance in their course. Our lakes and rivers in northern regions, are not like those of the Western States, the abodes of the pestilential miasmas, but are perfectly free from any such emanations, and people live in health along their borders. This State has always been remarkable, for the freedom of her inland navigation; canoes traverse the St. John, cruising along until they arrive where a portage of a few miles takes them into the Kennebec or Penobscot, and down they glide to the ocean; or they may follow the Aroostic, and so trace its course as to strike the Penobscot, within the narrow portage of two miles, and then follow that great river to the sea. It is not surprising that the Indian tribes should delight in the forests of Maine, where the birch tree, supplying them with materials for a house, and many articles of convenience, forms also their light canoe, which transports them from place to place, along the chains of lakes and rivers, as they pursue the chase. They formerly enjoyed a noble independence, and we almost grieve, when we see the scattered relics of these once powerful tribes, now reduced to the most abject state, by poverty, dependence, and intemperance.

I am fully aware that but little can be said in so small a space as I have allowed for this Report. I have but drawn some outlines, which may be filled up by future researches. It remains for me to speak more particularly on the subject of agricultural geology, which will form a conspicuous part of the next Report, which I shall hereafter have the honor of presenting, if it be your pleasure that this survey should proceed. All statistical facts, relating to the agricultural and mineral resources of the State will be gratefully received, and contribute to aid us in the completion of this important work.

Respectfully submitted,

By your obedient servant,

CHARLES T. JACKSON,

Geologist to the State.

DECEMBER 31ST, 1836.

APPENDIX.

Since the preceding Report was drawn up, I have arranged the collection of geological specimens, in a room appropriated for the purpose, in the State House at Augusta.

This collection, which was made during the past summer, consists of an instructive series of rocks, minerals and soils, the number of specimens arranged for the use of the Legislature, being about 650 selected specimens.

An equal number will be sent to the two Colleges of the State, and there will remain a series of duplicate specimens, which will be useful for exchanges with other States. The whole number of specimens collected, within the limits of Maine, during the past summer, amounts to no less than 3000 good specimens, which will serve to aid in demonstrating the geological resources of the State.

While engaged in arranging the cabinet, many gentlemen have brought in specimens of rocks, minerals and soils, which will serve to aid us in discovering the extent of the different rocks and minerals of the State. Numerous specimens of bog and other iron ores, yellow and red ochre, slate, granite, pyrites, plumbago, potter's clay, &c., have been sent for examination. These specimens, coming from different parts of the country, indicate the existence of many important localities, which we have not yet visited. I hope gentlemen will continue to aid us in this manner, and in order that they may do it effectually, I would suggest to them the propriety of always selecting good sized specimens, at least four inches square, and from one and a half to two inches in thickness.

Every specimen should have a label pasted upon it, indicating the town and county where it is found, and no specimens should be sent but such as occur in place—or in ledges of rock. Soils may be put up in tin boxes or in bags, containing about a pint each. Distinctly written labels should

in every case be attached to the packages. We are also desirous of obtaining the *skeletons* of the various *wild animals* of the State, and where perfect skins can be obtained, they may be preserved by dusting the inside of the skin with white arsenic. It is very desirable that we should thus preserve specimens of the ferocious animals of the State, before they are entirely exterminated. How can members of the Legislature vote a bounty on the destruction of animals which they have never seen?

If they have placed in the public museum well characterized specimens of these animals, then they will be better able to *realize* the fact of their existence.

I doubt if many members from the settled parts of the State can give us any account of the appearance of the wolf, wild cat, or loup-cervier, yet they are called upon to vote appropriations of money for their extermination.

Specimens of all the indigenous productions of the State ought to be collected and preserved, and although a collection of plants and animals of the State does not fall within my duties as the State Geologist, yet it is my earnest desire that these departments of science should be attended to, that a perfect cabinet of the Natural History of the State may be formed.

We shall also be happy to receive perfect specimens of shells and fishes, from the waters of the State. Shells should be collected with the living animal in them, if possible, and they may be prepared by immersing them in boiling water, and then extracting the animal by means of a wire. Fishes may be enveloped in a piece of cloth, and kept immersed in rum contained in a tin canister.

Any specimens which are worth collecting, are worth the trouble of well preserving, and they should be carefully packed, so that they may not be injured by transportation.

Minerals should be separately enveloped in strong paper, and packed tight in a box, with layers of tow or hemp between them. Shells and other delicate specimens may be packed in cotton, or they may be put up in small boxes. If the citizens of Maine will exert themselves to make such collections, they will have the satisfaction of aiding in the [e]tablishment of a complete collection of the Natural History

of the State, and many good results will follow from a knowledge of these various departments of science. I have suggested many subjects for your attention, in the belief that every person can aid us in some one of these departments of Natural History.

While on the geological survey, we made a collection of the various shells, crustaceous and articulated animals, which we found in our travels, all of which are deposited in the State cabinet.

We are indebted to Dr. Isaac Ray, of Eastport, for a collection of the shells found in the neighborhood of that place, and beg leave here to acknowledge the attentions and kindness of that gentleman.

Among the shells which we have collected, the following species have been recognized by Dr. A. A. Gould, of the Boston Society of Natural History. We have collected many other specimens, which have not yet been examined.

LIST OF SHELLS FOUND IN MAINE.

Bivalves.

Spirorbis nautiloides, *Lam.*
Balanus tintinnabulum, *Lam.*
" miser, *Lam.*
" fistulosus, *Brug.*
" geniculatus, *Conrad.*
Anatifa lævis, *Lam.*
Solen ensis, *Lin.*
Solecurtus costatus, *Say.*
Glycimeris siliqua, *Lam.*
Mya mercenaria, *Lin.*
" truncata.
" hyalina, *Conrad.*
Anatina leana, *Conrad.*
Mactra gigantea, *Lam.*
Solemya velum, *Say.*
Saxicava distorta, *Say.*
Sanguinolaria fusca, *Conrad.*
Crassina Danmoniensis, *Lam.*
" (*astarte castanea, Say.*)
Cyprina Islandica, *Lam.*
Cardium Icelandicum.
" Greenlandicum.
Unio complanatus, *Soland.*
Alasmodonta margaritifera, *Gmel.*
" undulata, *Say.*
Anodonta marginata, *Say.*
Modiola papuana, *Lam.*
" plicatula, *Lam.*
Mytilus edulis, *Lin.*
Mytilus pellucidus, *Pennant.*
Pecten Magellanicus, *Lam.*
" Islandicus, *Lam.*
Ostrea Canadensis, *Lam.*
Anomia ephippium.
Terebratula, one recent species.

Univalves.

Chiton.
Patella amœna, *Say.*
Crepidula fornicata, *Say.*
" plana, *Say.*
Helix albolabris, *Say.*
" thyroidus, *Say.*
" alternata, *Say.*
Planorbis trivolvis, *Say.*
" campanulatus, *Say.*
Physa heterostropha, *Say.*
Lymnæa columella, *Say.*
Paludina decisa, *Say.*
Natica heros, *Say.*
" triseriata, *Say.*
Turbo palliatus, *Say.*
" Vestilus, *Say.*
Fusus corneus, *Say.*
" decemcostatus, *Say.*
" Islandicus, *Martini.*
Purpura lapillus, *Lam.*
Buccinum undatum, *Lin.*
Nassa obsoleta, *Say.*
" trivittata, *Say.*

EXPLANATION

OF

GEOLOGICAL TERMS.

It has been thought advisable to give, at the end of this Report, a brief glossary of such terms as cannot be found in the ordinary dictionaries, such terms having no common English synonymes.

Alluvium, consists of clay, sand, and gravel, washed from the surface of hills and mountains, they being transported by currents of water, such as torrents, rivers, and brooks, from the high lands and deposited along their course. Etym. *alluo*, to wash upon.

Amorphous, a word derived from the Greek, signifying without regular form.

Amygdaloid. One of the forms of trap-rocks, the trap being full of rounded holes filled with various minerals, bears some resemblance to an almond cake, and the name is derived from the Greek, signifying, *like almonds.*

Amygdaloidal Trap, is produced by the contact of trap with other rocks, where a chemical action was exerted, and the trap being in a molten state, was blown into a scoria-like form, by the gasses or steam disengaged. The cavities are generally filled with infiltrated minerals, such as calcareous spar, chlorite, agate, &c. Similar appearances are seen in lavas of modern volcanoes, and they may be produced at will in the slag of any iron furnace, by allowing the slag to run over moistened sand. Various forms of lava may thus be produced, from the compact and glassy obsidian to perfect pumice stone.

Andalusite, a mineral consisting of alumina, silex, and a little oxide of iron, found first in Andulusia in Spain—hence its name.

Anthracite, is a very hard kind of coal, destitute of bitumen. It burns without smoke and with very little flame. Its name is from the Greek, signifying *coal.*

APOPHYLLITE, a simple mineral sometimes called fish-eye stone.

ARGILLACEOUS, means composed of clay. Etym. *argilla*, clay.

ARGILLITE, slate rocks composed of clay in a hardened state.

BASALT, a variety of trap-rock consisting of pyroxene, felspar, and iron.

BEDS, are masses of mineral matter included *between strata* of rocks and running in the same direction as the strata. If you place a book between the leaves of another book, it represents a bed between the strata.

BITUMEN, is an inflammable substance. It presents itself in a solid form and is then called asphaltum. In its liquid form it is like tar, and is called petroleum, and from it may be distilled a clear liquid called naptha. Bituminous coals contain this substance, which causes them to burn with a bright yellow flame and with smoke. Etym. *bitumen*, pitch.

BLENDE, a German name for sulphuret of zinc.

BOULDERS, a provincial term for rounded blocks of stone lying on the surface of the earth, or imbedded in the soil. They have evidently been transported, by the action of water, far from their native beds.

BRECCIA, a word from the Italian, signifying a rock composed of *angular fragments* cemented together. This term is synonymous with the term tuff. Thus we have trap-tuff, or breccia of trap, &c.

BUHRSTONE, a kind of silicious stone overlaying the *calcarire grossiere* of Paris. It is used for millstones.

CALCAREOUS, signifies a rock containing lime, the term being derived from the Latin *calx*, lime.

CALCAREOUS SPAR, is crystallized carbonate of lime.

CARBON, an elementary substance. In its pure crystallized state it is the diamond. Graphite, or plumbago, is composed of carbon. Carbon is the basis of charcoal, and of all kinds of coal. Etym. *carbo*, coal.

CALCIFEROUS, containing lime.

CARBONATE OF LIME, is lime combined with carbonic acid. Carbonic acid is composed of carbon and oxygen, and lime is composed of a metallic base called calcium, and of oxygen. [illegible]bonate of lime, when heated red hot, loses its carbonic acid

in the form of gas, but if it is heated under pressure equal to a column of 1700 feet of water, or 600 feet of liquid lava, it simply melts and crystallizes without losing its carbonic acid. [See Experiments of Sir James Hall, of Edinburg.] It was under pressure of the ocean, and of the overlaying rocks, that the carbonate of lime, forming the veins of calcareous spar, noticed in this Report, was rendered crystalline, by the action of trap-rocks. The latter rocks bearing evident proofs of having been thrown up in a molten state by subterranean power.

CHLORIDE, a combination of chlorine, a chemical element, with a metallic substance or base. Thus chloride of sodium, (sea-salt,) is a combination of chlorine with the metallic base of soda or sodium.

COAL MEASURES, the strata of rocks which contain coal, used synonymous with coal formation.

CRYSTAL, a regular geometrical solid, produced by the arrangement of symmetrical particles. The name was first applied to transparent substances in regular forms. The derivation of the name is from the Greek, signifying *ice*.

CHERT, a mineral consisting of silex, alumina, and lime, of a compact texture like flint. It is sometimes produced by the action of trap-rocks upon slate containing lime.

CHLORITE, a green mineral composed of delicate scales, or in a compact form. Its name is from the Greek, signifying *a greenstone*.

DIP, the angle which a rock makes with the horizon. Stratified rocks have the dip always at right angles with their direction. Place a book sloping in this manner, the slope is the dip, and the course of the leaves represents the direction of the strata.

DISLOCATION. A vein, bed or the strata of a rock may be thrown out so that they do not coincide, then they are said to be dislocated, or to have a fault.

DOLOMITE, a granular variety of magnesian limestone, named in honor of Dolomeau, a distinguished geologist.

DYKES. This term is of Swedish origin, and signifies, in geology, a wall or vein of rock which intersects another rock. Dykes always originate from below, and cut through the superincumbent rocks.

DRIFT, the name given by miners to a horizontal passage excavated in a mine.

EPIDOTE, a simple mineral of a green color.

Fault. [See Dislocation.]

Felspar, a mineral composed of silex, alumina, and an alcali, found abundantly in granite. Its name is from the German.

Fossil, a name given to petrified organic remains dug out of the earth or rocks.

Ferruginous, means containing iron. Etym. *ferrum*, iron.

Formation, a group of rocks or of strata of earth, referred to a common origin or period.

Fuci, marine plants.

Galena, an ore of lead composed of lead and sulphur.

Gneiss, a stratified rock composed of layers of quartz, mica and felspar.

Granite, an unstratified rock composed of mixed crystals of quartz, felspar and mica, united without any cement. It is a rock of igneous origin.

Graphite, a mineral composed of carbon and a small quantity of iron, varying from one to ten per cent. It is improperly called black lead or plumbago. The name graphite is from the Greek, meaning a stone which will mark or *write*.

Grau-Wacke, is a rock composed of various pebbles united by an argillaceous cement. It is generally of a grey color. Its name is of German derivation. This rock is one of the transition series, and is generally found alternating with argillaceous slate of the same age. In our country it frequently includes valuable beds of anthracite.

Greenstone Trap, a rock composed of hornblende, felspar, and oxide of iron. It is a rock of igneous origin, and was thrown up from below granite. It cuts through and overlies the new red sandstone formation. Its name is from its green color, and the word trap is from the Swedish word *trappa*, step or stair, these rocks being often arranged in broken columns like stairs.

Gypsum, a mineral composed of sulphuric acid and lime, generally containing 20 per cent. of water.

Hornstone, a silicious mineral resembling flint in hardness and in fracture.

Hornblende, a simple mineral of a dark green color, approaching blackness, crystallized in long prisms, or massive.

HYDRAULIC CEMENT, a substance which is used in subaqueous works, the cement having the property of hardening under water.

JASPER, a silicious mineral of a blood red color, containing oxide of iron and alumina.

LAMINÆ, signifies delicate leaves or layers of which some minerals are composed.

LAUMONITE, a mineral composed of silex, alumina, lime, and water. It falls to fine powder on exposure to dry air.

MANGANESE, the oxide of manganesium, a metal. Its ores are grey, black, and red.

MARL, a variety of clay containing carbonate of lime. It falls to powder on drying, and will effervesce when acids are poured upon it.

MICA, a mineral found in granite rocks. It is found in crystals and in plates, which split into thin leaves not more than $\frac{1}{10000}$ inch in thickness. It is elastic and springs back when bent, which property distinguishes it from talc. Etym. *mico*, to shine.

NOVACULITE, a compact kind of slate used for whetstones.

OUTCROPPING, the edges of strata of rocks where they appear at the surface.

PETRIFACTION, an organic substance converted into stone.

PORPHYRY, a rock composed of compact felspar, with little squares of felspar in its mass. Rocks having crystals of felspar thus included, are said to be porphyritic.

PRIMARY ROCKS, are supposed to have been formed first in the series. They never contain any organic remains of animals or vegetables. Granite, sienite, gneiss, mica-slate, &c., form what are called primary rocks.

PROT-OXIDE, PER-OXIDE, terms signifying the lowest and the highest degrees of oxidation. Oxidation meaning the combination of oxygen with any substance. Thus when iron rusts, it is converted into an oxide. The oxygen of the air combining with the iron.

PYRITES, a combination of iron, or iron and copper, with sulphur, is called by this name. It originally was given because iron pyrites gave sparks of fire when struck upon steel. Its name is from the Greek, signifying *fire stone*.

Pyritiferous, containing pyrites.

Quartz, a simple mineral, consisting of pure silex. It crystallizes commonly in the form of a six sided prism, with six sided pyramids at the terminations of the crystals. Its primative form is a rhomboid.

Sandstone, a rock composed of grains of sand cemented together, and often containing layers of mica. Its colors are red, grey, green, or white. When red, it is colored by per-oxide of iron.

Scoriæ, volcanic cinders.

Secondary, this group of rocks rests upon the transition series, and is characterized by a great number of fossil remains of land plants, marine shells, and animals, for a list of which, I refer you to Dela Beche's Manual of Geology, 1 v. 8vo. The great beds of bituminous coal are found in this class of rocks. The secondary rocks were set apart before the discovery of the transition, and since they formed the second group, took this name.

Shaft, a perpendicular pit excavated in mining.

Shale, is a kind of slate clay, impregnated with carbon or with bitumen, the former in case it occurs with anthracite, the latter when it occurs with bituminous coal. It is generally filled with impressions of ferns and other plants of the coal formation. Shale generally occurs in immediate contact with beds of coal. Etym. German, *schalen*, to peel or split.

Sienite, a rock like granite, from which it differs by having hornblende in the place of mica.

Specular Iron, ores of iron which shine like a mirror. They are composed chiefly of per-oxide of iron, which is crystallized. Etym. *speculum*, a mirror.

Strata, layers of rock which have evidently been formed by the gradual deposition of particles suspended in water. Stratified rocks were deposited horizontally, and have since tilted up so as to form an angle with the horizon. [See Dip.] Stratified rocks when in contact with rocks of igneous origin, become strangely altered, and often are rendered highly crystalline. It is thus supposed that gneiss, mica-slate, and talcose-slate are *metamorphic rocks*, or have been changed by heat and rendered crystalline.

Stratum, Strata, when the rocks are in regular layers like the leaves of a book, piled one upon another, each leaf representing a stratum. Etym. stratum, part. of a Latin verb, signifying

SULPHATE, means the combination of sulphuric acid with a base or metallic oxide.

SULPHURET, signifies the combination of sulphur with a metallic substance.

TALC, a mineral in laminæ like mica, but flexible, non-elastic, and soapy to the feel. It is composed of silex, magnesia, and water. It is commonly green or greenish white.

TERTIARY, this class reposes on the secondary series, and the name originally signified the third order. This formation is remarkable for the great number of fossil shells which it contains. The tertiary group consists of various limestones, clay, and sand arranged in regular strata. Lyell divides the tertiary formation into three groups—1st Eocene, 2d Miocene, and 3d Pliocene, these divisions depending upon the relative proportions of recent shells found in the strata. Eocene, means the dawn or beginning of recent species. Miocene, signifies a minority of recent species. Pliocene, a majority of recent species, these names being derived from the Greek.

TITANIUM, a metallic substance very difficult to reduce from its ores. [See books on Mineralogy.]

TRANSITION, rocks which are supposed to have been formed, while the world was undergoing a transition from an unhabitable to a habitable state. This class of rocks repose upon the primary, and are characterized by organic remains of animals and vegetables. The fossil trilobites are regarded as their characteristic fossils. Terebratulæ, producti, and various other shells abound in this series. [See Plates accompanying this Report.] Various marine plants and ferns are also found in this formation.

TUNGSTEN, is a metallic substance. Its oxides combine with alkalies, hence they have the properties of acids. [See books on Chemistry.]

VEINS, are distinguished by their *cutting across* the strata, and are not coincident with their direction. Veins are generally more irregular than beds.

ZEOLITE, a genus of minerals, which have the property of boiling or swelling in a peculiar manner when melted.

LIST OF PLATES ACCOMPANYING THIS REPORT.

From the rapid manner in which we have been obliged to print this Report, the following errors have occurred, which the reader is *earnestly desired* to correct with his pen.

p. 31, line 1st, for "have" read *has*.
p. 56, line 23d from top, for "silicia" read *silica*.
p. 83, line 6th from top, for "ox. iron alumina" read ox. iron *and* alumina.
p. 90, line 14th from top, after strata, insert *of*.
p. 100, line 11th from top, for "324,000" read 2,592,000.
p. 101, line 3d from bottom, for "225,000,000" read 180,000,000 of pounds.
p. 101, lines 3d and 4th from bottom, for "Every cubic foot" read *This ore*.
p. 112, in some of the copies, 10th line from bottom, for "ever" read *never*.

Cat

SECOND REPORT

ON THE

GEOLOGY

OF THE

STATE OF MAINE.

BY

CHARLES T. JACKSON, M. D.,

Member of the Geological Soc. of France; of the Imperial Mineralogical Society, St. Petersburg; of the Boston Soc. Nat. Hist., and Cor. Memb. Acad. Nat. Sciences of Phila.; Lyceum Nat. Hist., N. Y.; Albany Inst; Nat. Hist. Soc., Montreal; Prov. Frank. Soc.; Prov. Nat. Hist. Society; Amer. Acad. Arts and Sciences; Hon. Memb. Maine Inst. Nat. Sciences;
GEOLOGIST TO THE STATE OF MAINE.

AUGUSTA:
LUTHER SEVERANCE, PRINTER.
1838.

STATE OF MAINE.

RESOLVES AUTHORIZING FURTHER APPROPRIATIONS FOR CONTINUING THE GEOLOGICAL SURVEY OF THE STATE.

RESOLVED, That the Governor. with the advice of Council, is hereby authorized to employ some suitable person or persons to continue the Geological Survey of the State, at a salary not exceeding One Thousand Dollars.

RESOLVED, That the sum of Three Thousand Dollars be appropriated from the Treasury of the State, subject to the direction of the Governor and Council, and to be expended in continuing said Geological Survey.

RESOLVED, That in addition to the suits of specimens ordered by a former Resolve, suits shall be collected for the following institutions, viz: one suit for the Maine Institute of Natural Sciences, one suit for the Maine Wesleyan Seminary, one suit for the Westbrook Seminary, one suit for the Parsonsfield Seminary, one suit for the Eastport Athenæum, one suit for the Bangor Mechanics Association, one suit to the Teachers' Seminary at Gorham, and one suit for the Maine Charitable Mechanic Association.

RESOLVED, That it shall be the duty of the Governor and Council to lay before the Legislature, at its annual sessions, a detailed account of the progress of the Survey, together with the expenditures in prosecuting the same.

STATE OF MAINE.

IN COUNCIL, March 30, 1837.

CHARLES T. JACKSON, M. D., of Boston, Mass., is, by the Governor, with the advice and consent of Council, appointed "to continue the Geological Survey of the State," agreeably to the provisions of Resolves of the Legislature, passed March 30, A. D. 1837, entitled "Resolves authorizing further appropriations for continuing the Geological Survey of the State."

Attest: A. R. NICHOLS, Secretary of State.

To the Senate
and House of Representatives:

I herewith lay before you the Second Annual Report on the Geology of the State of Maine, by CHARLES T. JACKSON, M. D., Geological Surveyor of the State, under the Resolve of March 30, 1837.

EDWARD KENT.

COUNCIL CHAMBER,
February 22, 1838.

INTRODUCTION.

Few subjects have, for many years, more strongly excited public attention, than the Science of Geology; and we may justly attribute this general interest to the improved condition of the science, and its numerous applications to useful purposes.

Formerly, rude conjectures, imaginary hypotheses, and vague theories, which naturally arose from an imperfect knowledge of the subject, owing to the imperfections of the collateral branches of Natural History, caused many intelligent persons to consider the whole science as uncertain aud chimerical. This state of things has, however, been succeeded by more sound and perfect knowledge, and no longer is Geology reproached with being merely visionary and speculative.

It has now assumed the rank of an accurate and certain science, adapted to the physical and intellectual wants of an enlightened community—revealing to us the situations in which are found our valuable metallic ores, quarries of building materials, beds of limestone, and a thousand other articles of daily use. It traces out the precise situation in which we may expect to find fossil coal, and gives us a knowledge of the means of making rational explorations for that valuable combustible.

Soils being mainly composed of the detritus of rocks, and those materials having been spread out on the surface of the globe, in conformity to regular geological laws, a just knowledge of their mineral components, and their order of distribution, serves to direct the farmer in the selection of his farm, and the cultivation of the earth. It would be easy to trace out many other good results, which are attainable by this science, but so general has now become a knowledge of the subject, that it will be unnecessary for me to enter into minute details.

To the quarryman, architect, engineer, metallurgist, manufacturer, merchant and agriculturalist, this science is of vast and almost incalculable utility, and serves not only to direct many

of their operations, and to furnish them with the articles of their several professions and trades, while it prevents their being imposed upon by artful impostors or ignorant pretenders.

Enormous sums of money have been wasted, in every section of our country, in digging for treasures—mines of gold, silver or coal, in situations where a geologist would have in a moment decided such substances could not be found! Pyrites has been and now is frequently mistaken for silver or gold, black tourmaline for coal, or an *indication* of that combustible, while to the geologist it is a most certain proof that no coal will ever be found in its vicinity! Ores of brass and pewter are talked about as if any such ores really existed! Iron ores are warranted to contain from 80 to 90 per cent of that metal, while the geologist and chemist know, that no such ores can possibly exist. Yet companies are organized, and such pretensions are palmed off upon the community.

Some farmers run out the soil, instead of enriching it—cursing the earth with barrenness, instead of rendering it fertile—and then emigrate to some new district, to render that barren also! Are these things as they ought to be? Shall we not attempt to do something to relieve the present state of this most important of arts?

When we feel that we are in error, if we are wise we shall endeavor to correct ourselves, and eagerly embrace any plan that promises us sure relief. Science, embracing the great principles of all arts, combining the experience of all ages, indefatigable in its researches, strict and philosophical in its reasoning, tenders to us its aid, and furnishes us with the principles and the means for our improvement. With such knowledge, nature opens to us her illuminated page, and invites us to read her great and eternal laws, and by following her mandates, the elements become subservient to our will. Look back into the history of the arts and sciences but half a century, and contemplate their present state, and you will be astonished at the results already attained. The history of the past presages the future, and as much greater will be the improvements, as our means of knowledge are advanced. Problems, obscure and

incapable of being solved by our ancestors, are now easily explained. Knowledge, which formerly gave to the person who possessed it, the proud rank of a philosopher, is now the common property of school-boys. Chemical experiments, that would a century since have been considered magic, and brought the operator to the stake for witchcraft, are now mere juvenile recreations, and boarding-scool girls are familiar with the laws of chemical affinity.

The course of science is onward, and who will now dare to limit the future ? Knowledge is power, subduing all things to our will, provided we understand the laws of nature, and are obedient to their precepts. Collect facts, for they are the links of the chain of reason, by which we may mount to the causes of things. A single fact, taken by itself, appears to an unphilosophical mind extremely insignificant, and he who makes such a discovery, is instantly assailed with questions as to its uses. What is it good for ? What can be done with it ? &c. &c.

A philosopher, at Amalfi, in Italy, long before our nation had existence, was intent upon the examination of a curious property exhibited by a piece of iron ore. It attracted particles of the same kind of substance, and iron filings. In one of his experiments, he suspended the piece of iron ore by a thread, and found that it pointed towards the North star, and when turned in another direction, and set free, it instantly returned to its North and South position. This was a curious property, and I doubt not, if the experimenter had mentioned it, that he would have been asked, of what use is it ? What can you do with it ? and perhaps how much money can be made by it ? To all these questions he would reply, I cannot tell to what uses it may be put, but I do believe that every law of nature is useful, and this, among others, will be applied to some useful purpose. Impressed with such an opinion, he wrote to the Academicians of Florence, and forthwith the curiosity of those philosophers was aroused, and they too tried experiments with the iron ore, and presently discovered, that its magnetic properties were transferable to hardened steel. Behold the results! The mariner's compass was invented, and served to guide Co-

lumbus across the pathless ocean. A new world was discovered, and soon became the abode of civilized men. Our great nation now extends its arms from the St. Croix to the Capes of Florida, and westward to the Rocky Mountains, and the Columbia river, and is destined to cover this whole Continent. All this is to be attributed to the discovery of one curious property of iron ore!

Let us then learn to attach due importance to all facts we discover recorded in the book of nature, for however obscure they may at first sight appear, be assured that they will most certainly serve to advance human civilization.

Geology is a science composed almost entirely of facts, and the theories serving to explain them, are but the *rationale* of those facts. Such, at least, is the modern aspect of the science, and the more rigid are we in our deductions, the more imperishable will be the results. Hypotheses may be exploded, theories are subject to continual modifications, according to the light that may be shed upon their subject, but FACTS are in their nature immortal.

Impressed with this belief, I have taken especial pains to record all my observations during the present survey, while on the spot where they were observed, and the Report presents a transcript of them from my field notes. Being willing that the work should suffer in a literary point of view, rather than distort a single fact, I have avoided every attempt at ornate diction, and have endeavored to let nature tell her own story, standing myself merely as the recorder and interpreter of her laws.

With the ardent desire of learning the truth myself, and transmitting it to you with fidelity, I have devoted my whole strength to the task, and have, by faithful observations, arrived at the discovery of many important facts, the bearing of which, upon general science, may be at once foreseen.

The arts and sciences are all so closely connected, that the advancement of one department always serves to carry forward the others, and hence we may confidently look forward to many useful results.

REMARKS ON SURVEYS.

A geological survey signifies an examination of the nature, situation and mineralogical contents of all the various rocks, minerals and soils.

. It determines the order of super-position and relative ages of the different strata, their mode of disruption, and the nature of the unstratified rocks, that have been intruded from below, into the strata through which they cut, while, at the same time, the various beds and veins of valuable minerals form conspicuous objects for the surveyor's attention.

How is a geological survey to be conducted? This question may be answered as follows: The district in question is first to be examined, so as to ascertain the order of strata, and the relative age of each stratum, while, at the same time, the intersecting rocks are to be observed. The method pursued is first to form a plan of operations, so that all the observations may be recorded, in an orderly manner, that no confusion may arise in the completion of the work.

My plan for the geological survey of Maine, has been first, to obtain a longitudinal section of the State, and the sea-coast gave me an admirable opportunity of effecting that purpose. An outline map of the rocks along the whole coast of Maine, I have now completed, and this outline may be filled up hereafter, as may be found desirable. Then the North Eastern Boundary, according the treaty of 1783, was surveyed, and gave one transverse section of the strata of the State, from the sea-coast to the Madawaska river. This line has since been carried out to the Canada frontier, and to the St. Lawrence river. A sectional line was then surveyed from the mouth of the Penobscot, and up that river through the Allagash lakes, to the shores of the St. Lawrence, up the Sebois to the Aroostook, and down that river to the St. John. Two transverse sections, and one of a winding form, were thus obtained, which give the order of super-position of strata.

A line running through the State, longitudinally, N. E. and S. W. from Bangor to the New Hampshire line, gave the

length of the great formations, in a longitudinal direction; and the New Hampshire line served to complete a portion of the Western boundary.

It will be seen at a glance, that it has been my object to obtain the limits of the great rock formations of the State, and to make sectional lines. Besides which, I have also taken advantage of the great river courses, to divide the State into large natural squares, and the rivers are so disposed as to favor the operation. Thus the sea-coast forms the base line for all the squares. Between the St. Croix and the Penobscot and St. John rivers, we have the first great Eastern square; and between the Penobscot and the Kennebec, we have another, which is bounded on the North by the St. John. This forms the Middle square. Between the Kennebec and the New Hampshire boundary, we have our third, or Western square. These divisions are to be again subdivided, according to the minuteness of the survey, and the facilities for accomplishing the work. The Androscoggin meanders from the N. W. corner of the State, and sweeping in an irregular manner through the country, gives an admirable zig-zag section through the Western square, in a diagonal direction.

I have adopted this plan for several reasons. First, because it is easy to form a distinct idea of these natural divisions, so that they are more easily remembered than arbitrary sections. Secondly, because along the sea-coast and river courses, we gain more ready access to the naked rocks. Thirdly, the rivers run in such directions, as to give transverse sectional views. Fourthly, it is frequently the case, that there is no other way to cross the country than by the rivers. This is especially the case in our long sections through the State to Canada, and through the Aroostook territory.

Several of these sections are already completed, while others are yet to be made. The great Kennebec section promises to furnish much valuable information, and that region will be explored during the next campaign.

In surveying these various sectional lines, where it was found practicable, I have measured the altitudes of every important

point, by means of an excellent barometer, so that we shall be able, in a future report, to present you with profile views of the country, showing the relative elevations of the land, and the nature of the rocks, with their order and super-position.

A ground plan, or map of all the country we have travelled over, has been carefully kept, and will serve as a basis for a geological map of the State. It ought not, however, to be published until we have completed the work.

Embracing a wide territory, based upon so many rock formations, Maine possesses mineral wealth to an extent of which it is difficult to form an adequate idea, and respecting which, but little is yet known. The results of two seasons' labor have already given us ample satisfaction, and shew that Maine is not behind her sister States in natural resources.

During the infancy of any State, the inhabitants naturally avail themselves of those products most readily attained, and hence we find, that in Maine, the first industry was turned towards the forests, and timber became the principal article of export. As the forests began to be cleared of heavy pine trees, the people sought new occupations. Those on the sea-coast availed themselves of the fisheries and navigation.

Limestone quarries being discovered in some towns, changged the business of the community, and a new branch of trade sprang into existence.

Granite becoming an article of value for architecture, in the cities of the west, caused a portion of the community to turn their industry in that direction.

Farming became requisite to furnish supplies, and it was soon found that agriculture could be made a profitable employment.

In a more advanced stage of society, mines begin to be opened, manufacturing operations are carried on, and thousands of new sources of wealth begin to pour forth their various treasures. With increased resources, men soon begin to find time for literary and scientific pursuits, and a more exalted intellectual and moral culture extends itself over the country. Genius and taste soon burst the confines of mere mechanical and mer-

cantile employments, and a portion of the community find time for literary and scientific pursuits; and the productions of the mind begin to appear in various works of science or of taste. Thus we trace forward the progress of society, and it will be found, that the natural resources of the country engender and support every department of human culture.

When we travel over a region where civilized men have not yet appeared, and where the woodman's axe has never resounded, by a geological knowledge of the country, we can predict, with a great degree of certainty, the occupations of those persons who will subsequently settle there, and trace the various stages of their improvement; for the natural resources of the country produce the various employments which are followed, and knowing those resources, we can predict the pursuits of the inhabitants.

Dr. Buckland, in his admiable Bridgewater treatise, makes the following remarks, showing the influence of the geological structure of Great Britain, over the employments and physical condition of the people in that country.

"If a stranger, landing at the extremity of England, were to traverse the whole of Cornwall and the North of Devonshire; and crossing to St. David's, should make the tour of all North Wales; and passing thence through Cumberland, by the Isle of Man, to the south-western shore of Scotland, should proceed either through the hilly region of the Border Counties, or, along the Grampians, to the German Ocean; he would conclude from such a journey of many hundred miles, that Britain was a thinly peopled sterile region, whose principal inhabitants were miners and mountaineers.

"Another foreigner, arriving on the coast of Devon, and crossing the Midland Counties, from the mouth of the Exe, to that of the Tyne, would find a continued succession of fertile hills and valleys, thickly overspread with towns and cities, and in many parts crowded with a manufacturing population, whose industry is maintained by the coal with which the strata of these districts are abundantly interspersed.*

* It may be seen, in any correct geological map of England, that

"A third foreigner might travel from the coast of Dorset to the coast of Yorkshire, over elevated plains of oolitic limestone, or of chalk; without a single mountain, or mine, or coal-pit, or any important manufactory, and occupied by a population almost exclusively agricultural.

"Let us suppose these three strangers to meet at the termination of their journeys, and to compare their respective observations; how different would be the results to which each would have arrived, respecting the actual condition of Great Britain. The first would represent it as a thinly peopled region of barren mountains; the second, as a land of rich pastures, crowded with a flourishing population of manufacturers; the third, as a great corn-field, occupied by persons almost exclusively engaged in the pursuits of husbandry.

"These dissimilar conditions of three great divisions of our country, result from differences in the geological structure of the districts through which our three travellers have been conducted. The first will have seen only those north-western portions of Britain, that are composed of rocks belonging to the primary and transition series: the second will have traversed those fertile portions of the new red sandstone formation which are made up of the detritus of more ancient rocks, and have beneath, and near them, inestimable treasures of mineral coal: the third will have confined his route to wolds of limestone and downs of chalk, which are best adapted for sheep-walks, and the production of corn.

"Hence it appears that the numerical amount of our popula-

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the following important and populous towns are placed upon strata belonging to the single geological formation of the new red sandstone: Exeter, Bristol, Worcester, Warwick, Birmingham, Litchfield, Coventry, Leicester, Nottingham, Derby, Stafford, Shrewsbury, Chester, Liverpool, Warrington, Manchester, Preston, York and Carlisle. The population of those nineteen towns, by the census of 1830, exceeded a million.

The most convenient small map to which I can refer my readers, in illustration of this and other parts of the present essay, is the single sheet, reduced by Gardner from Mr. Greenough's large map of England, published by the Geological Society of London.

tion, their varied occupations, and the fundamental sources of their industry and wealth, depend, in a great degree, upon the geological character of the strata on which they live. Their physical condition also, as indicated by the duration of life and health, depending on the more or less salubrious nature of their employments; and their moral condition, as far as it is connected with these employments, are directly affected by the geological causes in which their various occupations originate."

It would not require a wizard's ken, to anticipate the occupations that will be followed upon the Aroostook territory. Timber cutting, followed by the more sure and profitable business of farming, will be the chief occupations of the people. Upon the various tributary branches that pour their waters into that river, there are numerous waterfalls, and we should at once assign them to the service of sawing boards, grinding wheat, and when their iron mines are opened, we shall have furnaces, founderies, nail-factories and machine-shops. The wants of the community naturally calling for these various articles, will at length cause them to be brought forth. Agriculture will draw upon limestone ledges for lime, and the gypsum and sandstone of the Tobique will become articles of commerce, supplying the farms and furnaces upon the banks of the Aroostook.

This is as yet but a vision of the future, but it will ultimately be realized.

The present Report having proved more voluminous than I had anticipated, it was found impossible to print the barometrical tables, and our remarks on the public lands, before the recess of the Legislature. On that account, it has been thought expedient to bind up and deliver the first part of the work, treating of the inhabited portions of the State, while the second part, or the survey of the public lands belonging to Maine and Massachusetts, in common, is yet to be printed, and will be ready for delivery at the time when the public laws are sent to the various towns of the State. The remaining document will form a pamphlet of about 100 pages.

SECOND REPORT.

To His Excellency Edward Kent, *Governor of the State of Maine.*

Sir:—Having been commissioned by the Governor of Massachusetts, to complete a general reconnoissance of the geological structure of the public lands, belonging jointly to the States of Massachusetts and Maine, and being appointed by the Governor of Maine, to make a Geological Survey of the entire State, in conformity with a Resolve of the Legislature, passed on the 30th of March, 1837, I made due preparations for the performance of these responsible duties, and entered the field early in the month of June.

Mr. James T. Hodge was appointed as an assistant on the part of Massachusetts, and Mr. W. C. Larrabee for Maine.

I have great pleasure in stating, that both of these gentlemen performed, in the most faithful manner, the duties assigned them.

It was thought advisable to dispense with the services of a Draftsman, since it was feared that the appropriation made by Legislature would not suffice to cover all the expenses of the Survey, and having been advised by the Governor to that effect, we did not engage an artist for that service.

It is, however, much to be regretted, that we are not enabled to present many sketches of the magnificent scenery of the

State, and I earnestly desire that we may be allowed every facility for the most ample illustration of the subject.

We all know and feel how strongly our love of country is associated with the aspect of our native hills, and no present would be more acceptable to us, when absent from home, than graphic illustrations of the scenery of our native land. Strangers and travellers are generally attracted towards picturesque scenery, and if made aware of the beautiful contour of the mountainous districts of the State, varied by thousands of magnificent views of highlands, valleys, plains, lakes, rivers and waterfalls, surrounded by dense and varied foliage, forming many most delightful landscape views, many of which are peculiar to Maine, they would hasten to enjoy such magnificent scenery, and thus increase the amount of travel in the country, adding no small share to the wealth of the people, spreading abroad accounts of the interesting region over which they had travelled.—Many, also, having been induced to visit the State, would finally become settlers, and thus add to the population of Maine.

I need but remind your Excellency of the tide of travel, which is continually flowing through the mountain passes of Switzerland, and the Tyrol—countries visited wholly for the sake of viewing magnificent mountain scenery, to satisfy you, that such subjects are strong and powerful inducements for the traveller to visit the country, and Maine presents many scenes, which if not equal in sublimity to those amid the high Alps, are equally picturesque, and are different from any views that can be seen in other parts of the world.

I have premised the above remarks to show how useful it would be to the State should we be allowed the services of a good draftsman, skilled in landscape drawing.

Although I do not make any pretensions to graphic skill, I have nevertheless been obliged to draw many outline sketches, a few of which we have been able to present in the form of wood cuts, the cheapest kind of illustrations, which, however, will aid essentially in giving an idea of the country. Many of the diagrams are thus introduced, and they will answer the pur-

pose, when the section is very limited. The long sectional views of the geological structure of the State, must be reserved for engravings or lithographic delineation, since they will form an atlas with the Geological Map, which will be presented when the work is complete.

There are many difficulties to be surmounted, in making a geological survey of a State, which has not been accurately surveyed and mapped. A very good general State Map of Maine has been published by Greenleaf, but its details are not sufficiently correct for laying down accurate Geological or Topographical observations.

There is, on that account, some difficulty in ascertaining the precise spot upon the map where any rock is to be put down. This difficulty we have endeavored to obviate, where it was possible to obtain town maps, made from actual surveys, but such plans are rarely to be met with, and even then, there may be but a single copy belonging to the town, and which cannot be spared. In such cases we require copies, and if we were allowed the services of a draftsman, much of my time might be saved and devoted to other more appropriate duties.

The mountains of Maine have never been measured, nor have the elevations of the various table lands ever been ascertained. It would therefore be utterly impossible for us to represent sectional views of the geological structure of the State, unless such measurement were made. On that account, I prepared myself with two excellent mountain barometers, and other instruments for measuring altitudes. The slender means in my hands did not allow me to purchase a Theodolite, (an instrument much needed in our operations) and on that account I obtained a simple and cheap instrument, which by some alterations which I had made in it, was found to be accurate for short distances. It has not, however, any telescope, and therefore will not answer for distant triangulations.

From my own stock of instruments I was able to supply deficiencies, and I have freely and cheerfully devoted them to the service of the State. A good pocket sextant, Sir Howard Douglas' reflecting semicircle, and a good compass, besides

many other instruments of mensuration, were contributed by me in order to carry on the survey with accuracy.

In making barometrical measurements, it is essential that great care should be used in order to obtain correct results. The elevation of the mercurial column must be ascertained at the level of the sea, and at the point of observation, at the same time, while the temperature is to be carefully noted. In order to ensure accurate results, I made arrangements for a line of barometrical correspondence across the State, observers having been chosen in the intermediate places, wherever a good Barometer was to be found, and a gentleman able and willing to keep a correct register. Then I took my barometers, and carefully compared them with each of the station barometers, and noted the difference between them, so as to correct for it in the calculations required.

TOPOGRAPHICAL GEOLOGY.

Having prepared ourselves for the arduous duty in which we were about to engage, the Assistant Geologist from Massachusetts and myself, embarked on board the steamboat for Portland, on the 9th June. I directed Mr. Hodge to proceed directly to Bangor, and there to await my arrival, while I stopped a day at Portland to make arrangements with Mr. Adams for the establishment of a barometrical station at that place, which that gentleman kindly promised to attend to, and has since faithfully performed the task in the manner agreed upon. The difference in our instruments will be found noted in the Barometrical tables, which I shall have the honor to lay before you.

After arranging the above preliminaries, I took passage in the stage-coach for Bangor, by the routes of Brunswick and Augusta; it being my intention to stop awhile in Brunswick for the purpose of consulting Governor Dunlap respecting the survey, and to obtain from him orders for the pecuniary means required in the work. This being effected, I visited Professor Cleaveland, and engaged his services in keeping a barometrical Register for the survey.

At Gardiner we also engaged R. H. Gardiner, Esq. to furnish us with a copy of the register which he is in the habit of keeping. At each of these stations the instruments used were very carefully compared, and where any difference existed, it was noted, and will be found in our tables.

Although it is rarely possible to make many geological observations while travelling in a stage-coach, I was still anxious to turn this journey to some account, and at each station where we stopped, I noted very carefully the height of the mercury in the barometer and thermometers, so that by comparing observations with those made at the other stations, and cal-

culating the results by means of barometrical tables, we can at once learn the exact height of each of the points in question above the sea level. The information derived from such operations is obviously valuable in a great variety of topographical operations, and in our work they were destined to serve as a basis for a sectional view of the Geology of that portion of the State.

At Augusta, I was promptly met by our excellent assistant, Mr. William C. Larrabee, who journied on with me to Bangor, from whence our excursions were to be made.

When Mr. Hodge had completed his preparations for the long and tedious voyage, which he was directed to make through the State wild-lands to the River St. Lawrence in Canada, instructions were given him as to the observations which were required. He then set out from Oldtown in a batteau and proceeded up the Penobscot, to Moosehead Lake. From thence through the long chain of lakes which supply the Allagash stream, and down that river to the St. John, from whence he ascended the Madawaska, crossed into Canada, and returned by the St. François, and down the St. John River, to Woodstock. The results of his survey are interesting and will be presented in our remarks upon the Public Lands.

It is now more particularly my object to describe those portions of the State, which we surveyed during the summer months, while Mr. Hodge was engaged upon the public lands. Three months were devoted exclusively to the settled portions of the State, and subsequently two months were spent by me upon the wild lands belonging to the two States in common. The first excursions made by Mr. Larrabee and myself, were devoted to the Geology of Bangor and its immediate vicinity. We have great pleasure in acknowledging the aid furnished us by Mr. Samuel Ramsdell, of that city, who has for a year past been an observer of the tertiary clay banks, from whence he has extracted a great number of curious fossil casts, specimens of which he has furnished for the State Cabinet.

The rocky strata on which rests the tertiary formation of Bangor and Brewer are argillaceous talcose, plumbaginous and pyritiferous slates. These various slates pass into each other

by imperceptible shades, so that it is extremely difficult to define their boundaries. In some places the slate rocks are charged with numerous quartz and calcareous spar veins, and they frequently contain a sufficient quantity of carbonate of lime to cause them to effervesce with acids. When the rock contains a large proportion of silex, it passes insensibly into quartz rock of a blue color, and occasionally beds of it are found containing a sufficient quantity of fine scales of mica to convert it into mica slate of an imperfect kind.

On the summit of Thomas's Hill, in Bangor, the slates may be seen cropping out—their upturned edges appearing above the soil. On the Kenduskeag at a high ledge, overhanging the river may be seen several varieties presented by this rock. It is there observed to be charged with calcareous spar, and is sometimes of a green color owing to the presence of chlorite.

In the city the slate may be observed passing into quartz rock on the side of Exchange street, where the strata run E. N. E. and W. S. W. and dip to the N. N. W. 80°. On the S. W. side of river the strata dip to the North. Near Brewer Bridge they run E. by N. and dip N. by W. 70°. A little above the bridge on the south side of the Penobscot in Brewer, there is a cliff of argillaceous slate, which rises to the height of about 80 feet, and there the strata may be observed to run N. N. E. and S. S. W. and dip N. N. W. 65°. About half a mile south of Bangor, the slate strata run N. E. and S. W. dip N. W. 60°. There are many other places in the vicinity of Bangor, where these rocks may be seen, but it would be tedious to enumerate all the localities. A sufficient number have been noticed to show that the whole substrata of Bangor and Brewer, are composed of this class of rocks. In some cases the surface of the plumbaginous slate is glazed with plumbago or graphite, and owing to this circumstance such rocks have sometimes been mistaken for coal. The whole mass of strata which are above described, bear evident marks of having been exposed to the action of heat and pressure, while from the great variety of substances which enter into a sedimentary de-

posit, there would evidently result the various metamorphic varieties of stratified rock which I have described. It will be observed that all the strata now rest on their edges and are highly inclined to the horizon, and this position could not have resulted from their original deposition, for all strata which are deposited by water, are arranged horizontally. Now it is clear that these rocks were deposited from water in horizontal beds, and that since that time they have been thrown up by a violent subterranean cause into their present position. These slates belong to the oldest transition formation and are generally destitute of organic remains.

TERTIARY FORMATION OF BANGOR AND VICINITY.

The Tertiary formation in Maine consists of a series of layers of clay and sand, which have been deposited by water upon the various solid rocks beneath. This deposit is evidently a sediment of clayey and silicious matter, and is arranged in regular strata shewing the effect of tranquil subsidence from the waters by which it was deposited.

These beds of clay contain distinct remains of marine shell fish in the various strata, arranged in such a manner as to evince their having lived and died exactly in the spots where we find them. This shows a slow and gradual deposition of the clay, for the shell fish lived near the surface of the different strata and must have had time to live, grow and multiply in each stratum before the next was deposited.

The lower tertiary at Bangor, is composed of blue clay, very tenacious in its structure, tough and adhesive. It contains so much vegetable matter, derived from decomposed sea weeds as to give it in many places the odor of marsh mud. The shells characteristic of this deposit, are the Nucula, Saxicava and Mya dehiscens.

There are a majority of recent species of shell fish in this deposit, and hence we consider it as equivalent to the pliocene formation of Lyell. Above this deposit we come to another mass of clayey strata of a yellow color, and remarkable for the curious casts of various forms which it contains.

Nearly all these casts have a long cylindrical tube running through them from one extremity to the other.

In Bangor, the greatest elevation which the tertiary clays attain is not more than 100 feet above the level of the sea, or 75 feet above the level of the Penobscot river at that place. The hill upon which Mr. Pomeroy's church is built is tertiary, and is the highest point which that formation attains in Bangor. The lower portions of this clay-bed contain distinct remains of the marine shells Nucula portlandica, Mactra, and Venus. The upper beds contain a great abundance of those strange cylindrical and conical casts terminated sometimes by a large bulb or tuber, which fossils resemble in their general structure the siphoniae described and figured in Rozet's Geology. There are however in this deposit a number of different species, and their peculiar shapes have caused them to be mistaken for almost every variety of plant and fruit. There is, however, good reason to believe that they are of animal origin, and were probably once molluscous or soft animals, having but little consistency, so as not to leave any solid matter indicative of their composition.

There are beds of ferruginous and silicious sand, which here and there alternate with the upper clay-beds. In some places it is of good quality for moulding. Examples of this kind of sand may be seen on the side of Exchange street, where the strata of clay dip to the South 15°.

In Cumberland street the lower tertiary deposit may be seen with the upper beds resting directly upon it. The strata dip to the S. W. 10°. This deposit attains an elevation of 50 or 60 feet above the river's level.

Crossing the Penobscot we enter the town of Brewer, where the same tertiary clays may be seen. A little above the bridge on the river's banks, occurs a high cliff of sand attaining an elevation of 86 feet above the high water mark upon the Penobscot.

At the various brick-yards in this town we had an excellent opportunity of examining the nature of the clay, and the vari-

ous shells which are contained in it. They are identical with those found in Bangor.

The clay, generally selected for making bricks, belongs to the upper tertiary, and is of a yellow côlor, and contains but very few marine shells. The blue clay answers very well for the same purpose, when there are not too many shells, but it is tough and hard to work.

The siliceous sand, found alternating with those clays, is used also in brick making.

These materials are so common in Maine, that little account is made of their value, but they are nevertheless sources of a very considerable income.

Thus, for instance, in the eight brick yards of Brewer during the last year, no less than three millions of bricks were made and sold. One million one hundred thousand machine-pressed bricks were made in three of these yards, during the same year.

So abundant is the brick-clay in Bangor, that in digging the cellars for most of the buildings, a sufficiency of it is dug out to make the bricks required for the edifice, and I understand that this is frequently done.

Brick makers are fully aware of the fact, that if clays contain any considerable proportion of lime, they will not answer for brick-making, since the lime is rendered caustic during the operation of burning, and when the bricks are moistened by water, the lime slakes, and they crack or burst to pieces. On that account they carefully avoid any admixture of shells, since they are composed chiefly of carbonate of lime, and produce the same effect.

These clays form extremely tough soils, and are liable to bake or harden by the action of solar heat, so that the roots of plants are often completely imprisoned by the hardened clay, and therefore the plant does not thrive.

In order to improve a clayey soil when it is found practicable, sand should be mixed with it, so as to break up its cohesive properties, and it often happens that hills of sand are found close at hand. After the texture of the soil is sufficiently

broken up, air-slaked lime may then be used for a top-dressing, and it will be retained for a great length of time, since the clay is so impermeable to water.

It is certainly worth the labor required to bring into a high state of cultivation those tracts of land, which are in the immediate vicinity of the city, and their improved produce will amply repay the moderate expenditures, which would be requisite for the purpose.

Above the tertiary formation we have a confused mass of rounded stones and pebbles, which bear evident proofs of their diluvial deposition.

The current of diluvial waters, in rushing over this district, excavated deep vallies in the tertiary deposits, and transported the detritus far to the south. Near the Court House in Bangor may be seen beds of coarse pebbles at the base of the hill, and the sediment becomes finer as we ascend, until we meet with perfectly fine clay. This locality shows that the coarse pebbles were deposited by swiftly running water, while the fine sand and clay prove a gradual subsidence in the force of the current.

On examining these pebbles it will be remarked that they are mostly those composed of varieties of slate, which occur in places north of the spot where they are now found.

EXCURSION FROM BANGOR TO THE BARNARD SLATE-QUARRIES.

In the report, which I had the honor to lay before you the last year, I described some of the valuable slate regions of Williamsburg, and gave a particular account of several localities upon Pleasant river and Whetstonebrook. Public attention having been awakened to the importance and value of the roofing slates found in those regions, farther researches were made in the vicinity, and several very excellent quarries were consequently discovered in the town of Barnard. Not having visited that district, I was desirous of doing so, and set out from Bangor in company with Mr. Larrabee, and one of the owners of the quarries in question. The whole route from Bangor to Atkinson is composed of slate rocks, which run N. E. and S,

W. and dip to the S. E. from 70° to 80°. In Atkinson, two and a quarter miles from the south line of the town, the dip of the strata becomes suddenly reversed—that is, the strata dip to the N. W. and at about the same angle. From this point we observed that the slate became more regular in its stratification, and less intermixed with quartz-veins.

In the town of Charleston the direction of the slate is nearly E. N. E. and W. S. W. and the dip is to the N. W. There are to be seen on the road side, where the strata have been recently uncovered, some very fine examples of diluvial furrows on the rocks, in place. These scratches run from N. 15° W. to S. 15° E. and are very regular and parallel, while they cross the lines of stratification at an angle of 70°. In and upon the soil all around there are multitudes of large boulders and blocks of granite, compact talcose and mica-slate, and a few large masses of diallage rock. As we descend the hill, going towards Sebec pond, we discover an immense number of huge blocks of granite, piled up on the north side of the hill. We traced the diluvial grooves in a regular manner nearly to Sebec pond, where we stopped for the night. On comparing fragments of the granite boulders found so abundantly in Atkinson, we observed the rock was identical with that which occurs North of the pond in Sebec, and since that place lies precisely in the direction to which the diluvial markings point, there cannot remain a doubt that these scattered blocks were derived from that place, and were moved by a powerful current of water, which swept them over the surface of the slate ledges on which they made these deep grooves and scratches as they passed. Many of the larger blocks were unable to mount over this steep ledge, and remain heaped up in confusion upon its northern declivity. It will be remarked at once, that there is a striking coincidence between the direction of these marks and the diluvial grooves which I have before noticed. Those in Portland run from N. 15° or 20° W. to S. 15° or 20° E. and here, in a distant portion of the State, nearly the same direction is observed. We have, however, many more equally good illustrations of this subject.

SLATE QUARRIES OF BARNARD.

In the town of Barnard, four miles N. of Sebec, we examined a ledge of roofing slate, of good quality, which runs N. 85° E. and dips 68° W. This quarry has been opened to some extent and promises well.

We then visited another quarry, where the direction of the strata was N. 81° 30' E. and dip 81° N. At this quarry beautiful slates 5 feet by 6 feet square, and of proper thickness for roofing, may be easily obtained. On the Merrill-farm there are about 900 acres of land underlaid by this slate. From the direction of this place from the quarries described in my last annual report, there cannot remain a doubt that the slate is continuous from those quarries to this spot.

Proceeding to Bear-brook, we examined a quarry where the workmen were engaged in splitting out slate, and there had a good opportunity of judging of the workable quality of the rock.

At this place, which is near the site of an old saw mill, the strata run N. 88° E. and dip 80° N. The slates are naturally divided into 24 seams or layers, and the number of roof-slates obtained from a foot was 37. I took occasion to measure the size of some of the larger slates in the quarry, and found that some of them were 6 feet wide, 9 feet long, and perfectly free from defects.

The quarry has been opened to the extent of 9 feet in depth by 65 feet in length.

It was extremely difficult to work at that season of the year, on account of the dense clouds of black flies, which covered every portion of the body, to which they could gain access, and the laborers bore on their bloody faces ample proofs of the virulence of these tormenting insects. The width of this bed of slate is not less than 80 rods, or 1320 feet, while we know that it breaks out in a number of places to the eastward of these quarries for the distance of 3 miles, and it is highly probable that it runs westward to Foxcroft, where quarries of the same kind of slate are wrought. From these elements we may form some idea of the enormous quantity of roofing slate, which lies

buried in this district, and we certainly shall feel very much ashamed of American enterprise, if we should still depend upon the quarries of Wales for our supplies of this valuable article.

I shall have occasion to speak more particularly of the value of roof-slate, when I come to treat of Economical Geology.

Returning to Bangor, I took pains to verify the observations made on our route to Barnard, and examined particularly some remarkable soils on our way. On the Wakefield-farm we observed that the soil was composed of a mellow loam, of a yellow color, crumbling readily when pressed with the fingers.

It contains fragments of calcareous slate and granite, and was doubtless derived from their disintegration. On examining the rocks in the vicinity, it was found that they contained a considerable proportion of lime, so that they answer well, when burned, for agricultural purposes.

The soil, above noticed, is said to produce in good seasons no less than 40 bushels of wheat to the acre. The field was covered with young, but luxuriant, wheat at the time we visited it, and probably ere this, the amount of the crop for this year has been recorded.

Specimens of this soil were taken for analysis. Beds of poor limestone, but fit for agriculture, are said to occur abundantly between Sebec and Brownville.

Having determined the extent and value of the above-mentioned quarries, we returned to Bangor, and noticed on our way a curious ridge between Charleston and Atkinson, which is called the Horseback. This ridge separates two tracts of low swampy land, now covered with cedars, and it is evident that formerly a fresh water lake existed on each side of this remarkable barrier. On examining the soil the gravel was found near the surface to bear evident marks of having been washed quite clean and smooth by the action of water.

I suppose, however, that the ridge itself is a diluvial accumulation, since its direction coincides with that of other "horsebacks" which I have examined, and also with the direction of the diluvial grooves before noticed. It is evident, however, that it served to separate two lakes which have modified

s surface in some degree, as above noticed. A small branch f this ridge strikes off in a curve, just as if it had once formed ie shores of a lake.

It was originally our intention to have followed the Piscatquis river and Wilson's stream in a boat, and to have crossed ver to Moosehead lake, but owing to the tormenting swarms f black flies and mosquitoes, which annoyed us excessively, determined to take another route and work elsewhere, until heir virulence was over. On that account we effected a reteat from the woods, and bent our course towards the Penobcot below Bangor.

ECTION OF PENOBSCOT RIVER FROM BANGOR TO BELFAST.

Having made an examination of the vicinity of Bangor and Brewer, my next object was to take a sectional view of the anks of the Penobscot River from Bangor to Belfast.

For this purpose I hired a small boat, and accompanied by Mr. Samuel Ramsdell, who was engaged in the place of Mr. Larabee, the assistant geologist, who was necessarily absent, we proceeded slowly down the river, exploring carefully the various rocks on its western side. The first high cliff we examined was Dutton's Head, which is composed of sand and clay resting on argillaceous slate-rocks. In the town of Hampden, three miles below Bangor, near the steam saw-mills, we saw extensive ledges of argillaceous slate filled with an infinity of small veins of calcareous spar or carbonate of lime. These rocks are regularly stratified, and run N. E. by N. and S. W. by S. and dip 70° W. S. W. They are of a blueish-grey color, and contain so much carbonate of lime, that by disintegration they form a good calcareous soil.

Below Emery's steam mills the shores of the river are rocky, and the ledges of slate run parallel with the course of the river at that place.

One mile below Hampden, we observed that the slate strata were much contorted, and presently we discovered that they were highly charged with Iron-pyrites; from these circumstances it was thought probable we should soon discover a dyke of green-

stone trap-rock—and having travelled a few rods farther along, we found such a dyke cutting through the slate, which has been broken into fragments, forming a kind of breccia, where the igneous rock has been thrown up. We found also, a number of narrow beds of very compact grey limestone near this place.

The shores below Hampden are composed of rough craggy slate-rocks, overhanging the river, alternating with rounded hills composed of sand and various pebbles, which have evidently been transported and deposited in their present localities by a diluvial current.

Approaching Frankfort, we came first to regular strata of gneiss, and then to that variety of stratified granite, called granite-gneiss.

The strata run N. E. and S. W. and dip 60° N. W. This rock has been wrought to some extent as a building stone. It contains black mica arranged in parallel laminæ. Here and there we observed small veins of coarse granite intruded into its mass. Proceeding down river, we next came to the coarse granite on which the granite-gneiss rests. At Marsh Bay, this rock forms hills 200 feet high above the river.

We stopped at Marsh river, 15 miles below Bangor, for the purpose of examining the granite mountains near that place. Mr. Pierce and Mr. Kelly joined our party on our excursion to Mt. Waldo, the height of which we proposed to determine by barometrical measurement. The next morning we made the necessary preparations for this purpose.

In our table of barometrical heights, the reader will observe that on the 27th June, 7 A. M. the barometer stood at Sawtell's tavern 25 feet above the river's level at 30.180 inches, the temperature of the instrument 62° F. Proceeding up the gradual slope of the rising land, we stopped at the house of Mr. Daniel Walden, near the base of the mountain. Here we observed, at 9¼ A. M. Bar. h=29.650 T.=68°. t air=66°.—Angle of elevation of the mountain. 8°. I reached the summit of the mountain at 10 A. M. and hung up the barometer on the shady side of a dead tree, 3 feet below the highest point of rock. It stood h=29.080 T.=64.

From the above observations it will appear by calculation, that the alttitude of Mt. Waldo, is 964 feet above the level of the river.

This mountain is a commanding eminence, seen distinctly from Bangor, and for the distance of 20 miles around. It is a huge dome shaped mass of naked rock, which was formerly covered with an abundant growth of small juniper and other forest trees, which have been destroyed by fire. Now a few low birch trees grow here and there on those spots where any soil remains, and on some places there are an abundance of blueberry bushes, which struggle for existence in the scanty soil. From the summit of this mountain, we enjoy a magnificent view of the surrounding country. On the North, the beautiful Penobscot river is seen winding its way from Bangor, and coursing by to the sea on the South East.

Hampden bears N. N. E.

Bucksport bears East.

Belfast " S. W. by S.

Brigadier's Island bears S. S. W.

The mountain is composed entirely of a peculiar porphyritic granite, consisting of large crystals of pure white felspar, black mica, and a little quartz. The average size of the crystals of felspar, is about $\frac{1}{3}$ of an inch in width, and of variable length, and they are so disposed as to give the rock a porphyritic appearance. This granite is remarkably pure, free from foreign matters, and will resist well the action of the weather. Blocks of any size desired may be easily obtained, and I observed, that for 200 yards square, that there was not a single crack or fault in its mass. It splits into sheets, or huge blocks, when quarried, and will doubtless be wrought for architectural purposes. When hammered, it does not shew its porphyritic structure, but it is of very uniform color.

The Pharaohs of Egypt would have gloried in a mountain like this, for after removing sufficient granite to build a city, the nucleus, if left in a pyramidal form, would be more than twice the magnitude of the Great Pyramid of Egypt, and this mountain has the advantage of being founded upon an immoveable basis.

The following wood-cut will serve to give an idea of the appearance of Mt. Waldo, and its adjacent mountains.

View of Mt. Waldo, Mosquito Mountain, and Treat's Mountain, from Penobscot River.

After having examined Mt. Waldo, we ascended Mosquito mountain, and measured its height. At the level of the river, the barometer stood at 30.100 T.=66°. On the summit of the mountain it stood at 29.430 T.=59°. Calculating from these observations, we find the height of Mosquito mountain to be 527 feet above high water mark.

This mountain is composed entirely of porphyritic granite, which is extensively quarried for building stones, by the Frankfort granite company. The rock is certainly a very handsome building material, and withstands the action of the weather without changing its color. It is, like the Mt. Waldo stone, composed of felspar in large proportion, having a porphyritic structure. Its mica is black, and the quartz is in small quantity. I could not discover any pyrites, or other material that would cause it to decompose. On examining the weathered surface of the rocks, in place we observed that the mica was the first ingredient that underwent decomposition. When the felspar decomposes, it becomes of a dull or earthy white color, and loses its brilliancy, but does not become brown.

From the workmen at the quarry, I learned that the first operations upon this stone began in the month of May, 1836, since which time more than $50,000 worth of granite has been quarried and hammered for the New York market. The Albany exchange is being constructed of this stone. I measured several blocks, as they were hammered for this building, and found them to average from 10 to 15 feet in length, by 3 feet in width, and 1 foot in thickness, containing about 45 cubic feet to each stone. There were a large number of blocks, wrought in a beautiful manner, and ready for the market. On examining the loose blocks, on the side of the hill, it appeared that many could be obtained upwards of 40 feet in length, and free from seams.

This rock splits perfectly well, in the directions required, and is easily wrought. It has a light color when hammered, and will appear well in any kind of architecture.

I was informed, that no less than $20,000 had been expended by this company, in excavating a canal to the base of the mountain. This canal will enable the proprietors to ship the granite more readily.

Crossing the river, we stopped at Bucksport and examined some specimens of limestone which is found at that place, imbedded in slate rocks.

Having examined the rocks for some distance along the eastern shore of the river, we re-crossed to its western side. Nearly opposite Bucksport the mica slate is seen cropping out at the river's side. The strata run N. E. and S. W. and dip 75° S. E. This rock splits into regular sheets, and will answer for pavement, flagging stones, fences, &c. At Fort Point the argillaceous slate again shews itself, and is highly charged with pyrites, so that its surface is rendered brown by the abundance of per-oxide of iron deposited upon it.

The pyrites mixed with the slate causes it to decompose, and sulphate of alumina and sulphate of iron are formed. It is not yet certain whether this rock can be advantageously wrought for alum, but it will certainly work as well as that now undergoing trial, on Jewell's Island in Casco Bay.

Owing to a strong head wind, we were unable to proceed directly to Belfast, and therefore ran into Castine and examined the rocks near that town. The strata of argillaceous and talcose slates, are there seen in numerous places, and owing to the presence of iron pyrites, there are mineral springs of some repute, which deposit a large quantity of oxide of iron in the meadow through which the water runs. They are strongly charged with carbonate of iron, and are a good chalybeate or tonic water.

From Castine we crossed over to Belfast, and travelled from that place to Bangor, by land, examining the different rocks as we passed along. The rocks of Belfast, like those of Castine, consist of various slates, composed of argillaceous and talcose matter, with veins of quartz and laminae of plumbago or graphite interspersed. On our return to Bangor we passed through the town of Prospect, where we observed extensive beds of tertiary clay. The upper beds are yellow and contain remains of siphonae—while the lower are composed of blue clay, containing many marine shells. The clay is extensively used for the manufacture of bricks. Diluvial sand occurs near the brick yards, and is used in their manufacture.

Diluvial blocks of granite occur between Belfast and Frankfort, and were evidently derived from Mt. Waldo and its immediate vicinity. We visited several granite quarries on the eastern side of the mountain, where this stone has been wrought to some extent. At Kelley's quarry, good granite split into proper dimensions has been obtained and sold during the past year, at 17 cts. per cubic foot on the spot, or at 25 cents in Bangor. Several buildings in that city are constructed of this stone. Sargent's and Walker's buildings are mentioned as examples.

Bussey's quarry, situate three quarters of a mile North of Frankfort, has been wrought to a small extent. It is of that variety called granite gneiss, the layers or strata of which curve gently to the West. There are a few particles of iron pyrites scattered through the rock which, on decomposing, produces brown stains. There are also some veins of coarse granite

which intersect the rock. This quarry was opened four years ago, and was wrought to some extent; but was finally abandoned, owing to the foreign matters in the rock. Mansfield's quarry, a quarter of a mile North from that last described, is likewise a granite gneiss, which was quarried a while, and then abandoned, since it did not split true.

At Hampden we again came to slate rocks which continue to be seen here and there on the road to Bangor.

It will be observed that the slates on the Penobscot below Bangor, are highly inclined, and rest, as it were, on their edges, the ends of which are frequently exposed along the river's course. Mt. Waldo, Mosquito Mountain and Mt. Heagan, are masses of granite which were probably elevated after the deposition of the slate through which the granite forced its way, producing such chemical changes in the strata that rested upon it, as to render them crystalline in their structure. Thus we suppose that the mica slate resting on both sides of Mt. Waldo, was formed from sedimentary matter, which was originally in a state resembling clay—but which, by the action of heat, has become crystalline.

COAST SECTION.—BLUE HILL.

Having determined, during midsummer, to devote our attention to those portions of the sea coast of the State, which we had not surveyed during the past year, I wrote to Capt. F. A. Jarvis, of the U. S. Revenue boat, at Castine, desiring the use of that vessel for our cruise. This request was most cheerfully complied with, both by Dr. Bridgham, the Collector of that port, and by Captain Jarvis. I have great pleasure in acknowledging the kindness and attentions of these gentlemen, who offered us every aid in their power. We also feel indebted to the pilot of the Revenue Boat, Captain Dyer, and to the whole crew for their strenuous exertions in our behalf, during our voyage along the complicated rock-bound coast, which we were called to explore.

Our first excursion was intended for the purpose of exploring the coast to Bluehill—a district, which we had slightly ex-

amined last year. We therefore ran down the Penobscot Bay, with a light westerly breeze, and had an admirable opportunity of landing on many of the islands in our way. Islesboro' is composed of various kinds of slate rocks, charged with either talc, plumbago or pyrites. There are also several beds of limestone, included between the strata. We ran down by Deer Isle, at which place we did not stop until our return from Bluehill, but we had a very fair opportunity of making an outline sketch of the island, as we passed gently along.

Bluehill Mountain, is a very commanding eminence, which forms a magnificent background to the beautiful scenery as we enter the harbor. The following wood cut will give some idea of the appearance of Bluehill Bay.

View of Bluehill Mountain from the Outer Harbor.

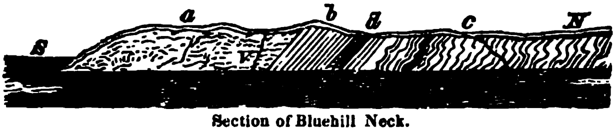
On arriving at Bluehill, I made known to several gentlemen our intention of exploring their vicinity, and was most cordially assisted by them in all our labors. No less than forty of the active and enterprising citizens of this place volunteered to go with us to the summit of the mountain, on the next day, when we proposed to measure the altitude of that eminence. We were not allowed to stop at the hotel, but were most kindly and freely entertained by the polite citizens of this town. It would not be proper, nor would it be desired by them that we should par-

ticularise those individuals who treated us with so much kindness, and therefore we beg leave here to tender our grateful acknowledgments to all.

Having prepared ourselves for an excursion to the mountain, we first took the level of the mercurial column in our barometer, at high water mark, and found it to be at $8\frac{3}{4}$ A. M. 30.012 inches, temperature of the instrument being 69°. On attaining the summit of the mountain, at 10 A. M., the barometer stood at 29.018 t=70°, These observations calculated with corrections for difference of temperature, and for curvature of the earth, give 914 feet for the height of the Mountain.

On exploring the geology of this mountain, we were surprised at its curious structure. It is composed of the most contorted variety of gneiss, that I ever beheld, presenting a perfectly curled mass of strata. This rock contains a considerable quantity of oxide of manganese disseminated in it, and on examining farther upon the S. E. side of the mountain, we discovered a huge bed of the gray silicate of manganese, which is fifteen feet wide, and runs E. N. E. and W. S. W. cutting through the mountain side. This mineral, I believe, has not yet been brought into use in the arts, but it will answer admirably for the coloring of glass, giving it a most rich and beautiful amethystine-purple tint. Other uses will probably ere long be devised in order to render it available in the arts. Before leaving the mountain our companions raised a pyramidal monument of stone, 12 feet high upon its highest peak.

Our next excursion was directed to Bluehill Neck, where we found the rocks to be gneiss and a curious variety of talcose and micaceous slate, containing veins of quartz and iron pyrites. The strata are remarkably contorted, but the general dip is to the S. E.

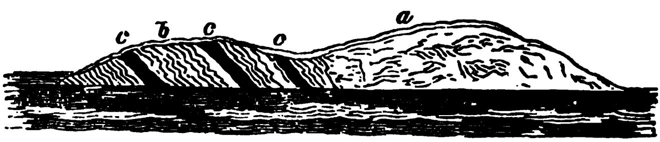


Section of Bluehill Neck.

a Granite.
b Gneiss.
c Talcose and mica slate.
d Dyke of trap.
v Vein of quartz and pyrites.

We found at this place, arsenical iron, chlorite, and numerous veins of spongy quartz, exactly like that variety from North Carolina and Virginia, which contains native gold. We could not, however, discover any visible particles of this metal. If gold mines are really desirable, this rock is the most probable matrix in which the metal may be found—still, however, I should consider its discovery a great evil to Maine, since it invariably produces extravagant expectations, which are rarely realized, as may be seen in examining into the history of the gold mines of the southern states.

Crossing over to Long Island, in Bluehill bay, we found the rocks to be gneiss and talcose-slate, resting upon granite, the latter rock forming about one half of the island. There are, also, three dykes of greenstone trap, which cut through the strata, and appear on each side of the island. In the granite, near its junction with the gneiss and trap, we found numerous veins of quartz, containing copper-pyrites, and arsenical iron. We also found several veins of fluor-spar, and while we were still remarking on the probability of the occurrence of lead ores with this mineral, with which it is frequently associated, one of the young gentlemen of our party handed me a specimen of galena, or the sulphuret of lead, which he found close by one of these veins.



Section of Long's Island, Bluehill bay.

a Granite.
b Gneiss and mica slate.
ccc Trap dykes.

The fluor-spar occurs in a vein 8 inches wide, and runs E. N. E. and W. S. W.; dipping to the S. S. E. It is of a light grass-green color, and is crystallized in octahedral forms. This mineral is now used only for chemical purposes. It is composed of fluorine and calcium, and by means of sulphuric acid, the fluoric acid is formed and disengag-

ed. This gas has the property of dissolving silex, and will serve to engrave upon glass.

Large druses of crystals are found in these veins of quartz.

Phosphate of lime, of a light green color, is exceedingly abundant upon this island, there being veins of it 10 inches wide, traversing the granite.

Sulphuret of molybdena is also very abundant; occurring in large and brilliant tabular prisms, of 6 sides; also in large intersectings and radiating plates.

These minerals are among the usual indications of tin ores, and the granite is of the kind in which that metal is commonly found. We did not, however, succeed in finding any specimen of the ore on Long Island. The granite is of coarse texture, and contains reddish brown felspar. It is not worth quarrying, since so many better varieties occur close at hand.

It is probable that wider veins of lead ore will be found on the Island, for I have since learned that the fishermen have frequently found large masses of several pounds weight, and have reduced it to lead for their uses.

Our next object was to examine the various granite quarries, which have been opened at Bluehill. We therefore proceeded to Long's Cove, where there is a quarry, owned by Mr. J. Darling. The granite is of a light color, containing an abundance of felspar, with a little black mica and quartz. These minerals are well mixed, so as to produce an uniform color. Blocks of building stone, 5 feet thick, 20 feet wide and 16 feet long, may be readily split from the ledge. This quarry is situated on the south side of Long's Cove. On the opposite shore we examined a locality, where it was formerly supposed that a coal mine existed. The rocks there are granite, and the mineral mistaken for coal is the radiated black tourmaline, or schorl. It is, most assuredly, a certain indication that no coal will be found there, instead of being, as was supposed, an indication of that combustible.

We next examined a quarry called the Mc-Herd ledge. It has been but little wrought, but the granite is a most beautiful variety, of fine texture, and working to an exceedingly

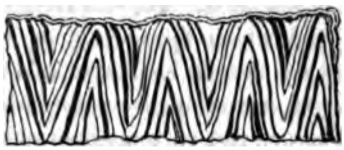
sharp edge. It is composed of small particles of felspar, quartz and a little black mica in fine scales. This rock will work admirably for fine ornamental devices and for window caps. It cannot be learned whether it will quarry well as a building stone, until it is regularly cleared and opened. Blocks from 6 to 10 feet square may be now obtained. The Mc-Herd quarry is at the head of Long's Cove, 400 yards west from the bridge.

The quarry belonging to the Bluehill Granite Company was next examined. It is situate 1½ miles E. S. E. from the village of Bluehill, on the North East side of the Narrows. It originally cost $5500, and is chiefly owned in New York. The granite is rather a coarse variety, composed chiefly of white felspar, containing little black mica and quartz. It, however, splits well, and works to a sharp edge. When smooth hammered, it is a handsome stone. Columns 4 feet square and 28 feet long, have been split out for the Reformed Dutch Church now building in New York. These columns will contain 488 cubic feet, and weigh 35 tons, and much larger masses may be obtained if desired. One block weighs 84 tons. This granite hill rises quite abruptly from the sea to the height of about 300 feet, and extends ½ mile in an E. S. E. and W. N. W. direction, and ½ mile to the N. E. The extent belonging to the Company is about 250 acres.

A rail road is being constructed to the top of the hill, at the cost of $10 per rod; the distance being 75 rods, the cost of the rail road will be $750. It is probable, however, that it will really cost more than this sum. I cannot perceive any advantage in making a rail road here, for the granite of excellent quality extends by a regular slope quite to the sea, and there would be but little expense in removing the stone, even if it was to be brought down the hill-side, from near its summit, the distance being so trifling. By means of the dimensions given for this locality, the amount of stone may be estimated.

On examining the weathered surface of the ledge, it was found that the granite withstood well the action of air and water, the first mineral giving way being the black mica; and the stone retains its color unimpaired.

Returning to Bluehill, after having ascertained the extent and value of the granite quarries, we next explored the various localities in the vicinity of the town. Two miles N. by W. from the village, we examined a bed of limestone, which is included in gneiss. There are several beds alternating with the rock, and the two substances are most curiously contorted, exhibiting a very remarkable kind of stratification. The following wood cut is a copy, taken from a piece of the rock.



The direction of the strata, taken upon the average, is about E. S. E. and W. N. W. We traced the width of these beds to the distance of 300 feet.

Owing to the ease with which lime of a better quality may be obtained from Camden and Thomaston, it will not be expedient to burn this rock for lime. It has, however, produced beneficial effects on the adjacent soil by its decomposition, and if wood was cheap enough on the spot, it might be burned for agricultural purposes.

On the estate of Mr. Jacob Osgood, we examined a bed of bog-iron ore of good quality, and black oxide of manganese.—The deposit of iron is, however, not sufficiently extensive to supply a blast furnace. Should, however, any such works be erected in the vicinity for the purpose of smelting the ores from Marshal's Island and Mt. Desert, then the Bluehill bog-iron would find a ready market, since it will work advantageously with those heavy ores.

Two and a half miles from Bluehill, we were shewn a remarkable chalybeate spring, which is highly charged with carbonate of iron, and may become valuable for medicinal purposes, as a tonic. It is surprising to see the enormous quantity of iron deposited by this spring. Where it flows out into the meadow, a deep and thick bed of beautiful brown carbonate of iron is deposited, which may be advantageously used for paint. Dried

at a moderate heat, it is yellowish brown; heated to redness it assumes a deep red color, equal in richness to the Venetian red.

In the course of time, this mineral spring will become a place of resort for invalids and people of leisure, and there is no doubt that its use, combined with an occasional excursion to the mountain, would prove a sovereign remedy for dyspeptic complaints and many other diseases common to sedentary people. In order that the spring may come into notice, it will be advisable to clear it of sediment, and to place a slab of granite with holes in it, through which the water may rise into a well-tub. Then a small and tasteful building should be erected near or over it, to serve as a resting place for visitors, who may use the water. The moment such arrangements are made, the tide of travel will naturally carry many persons to the Bluehill Springs, and the place being one of the most picturesque districts on the coast, would soon become celebrated as a place of resort.

Near the tide-mills on the Camdage farm, we visited the locality from whence the specimen of wolfram was sent to me last year, and after a dilligent search, discovered the mineral in place. It occurs in the granite rocks, which rise through the gneiss, and forms a hill a quarter of a mile beyond the house. This rock contains numerous veins of quartz, filled with crystals and plates of sulphuret of molybdena. In the adjacent granite, we found the wolfram in flattened and wedge-shaped crystals. These minerals are both indications of tin, and it will certainly be worth while to examine very carefully the decomposed granite in this vicinity, in order to discover if there are not grains of tin ore imbeded. It occurs disseminated through granite, and is found also in veins. It has a reddish brown color, and is very heavy, so that it may be separated from the soil by washing and pouring off the water, when the oxide of tin would be left.

On this mountain, we found a large mass of arsenical iron, a mineral valuable for the purpose of granulating lead in shot making, and also as an ore of arsenic.

Leaving Bluehill, we set out for our western tour, stopping

at the most interesting islands. We landed upon little Deer Island, and travelled from one extremity to the other, inspecting the rocks on our way. Near the southern extremity of this island, we noticed a remarkable mass of greenstrone trap, mixed with serpentine, which has burst through the strata of slate-rocks, and rises to the height of 150 or 200 feet above the sea-level. This mass resembles the appearance of a volcano, more nearly than any other spot I have seen in Maine. It here protrudes through the slate, which it has torn up all around, and melted, in many places, into a perfectly white hornstone or chert, while in other places, the chemical action which took place, has blown the whole mass into a sort of scoria or amygdaloid. The trap-rock is mostly columnar, and is broken into quadrilateral columns. A deep ravine separates the slate from the trap, so that it resembles a cone in the midst of a volcanic crater. Several dykes are sent off from this mass through the adjacent rocks.

On the North Western extremity of the island, occurs a beautiful variety of green novaculite, or hone-stone, which is suitable for oil-stones, and is equally valuable with that brought from the Levant. It is worth while to bring this article into the market, where it will meet with a ready sale. The hone-slate runs N. and S. and dips to the E. 25°. Masses may be obtained 3 feet square, and of any required thickness. The price paid for Turkey oil-stones, in Boston, is from 30 to 50 cts. a pound. This stone is equally as good as the foreign article, and if it will sell for one quarter as much as the Turkey stone, it will become a profitable article of trade.

We visited Buck's Harbor, in Brooksville, for the purpose of examining the extent and value of the granite, which is quarried at that place. This locality is directly opposite little Deer Isle, and has a small, but very commodious harbor, with deep water.

On ascending to the quarries, we had a good opportunity of seeing the stone in its rough and hammered state. It is rather a coarse variety of granite, but when split or hammered, has a very uniform appearance, and is a handsome stone. Its pre-

dominating ingredient is white felspar, and it has but little black mica and quartz; hence it is of a light color. The weathered surface of the ledge shows that the mica decomposes first, the felspar becomes white and earthy, as it usually does when pure, and the quartz remains unaltered. This is the order of decomposition, but the rock appears to withstand the action of the weather remarkably well. The extent of the quarry may be estimated at 80 rods in length, 300 feet in height, and 100 rods in width, which will give 634,000,000 cubic feet as the estimated mensuration of the mass.

The quarry belongs to a New York and New Jersey company, and they own about 30 acres of the hill: 10,000 tons of rough-split and hammered granite have been sent from hence to New York. The cost of quarrying and delivering on ship-board was only from $1,12 to $1,25 per ton, rough-split. It sells for 10 cents per foot when rough-hammered, and 30 cents per foot when fine-dressed. Cost of transportation to New York, from $2,50 to $3 per ton. At the time we visited this quarry, it was under attachment by the workmen for their wages, &c., the amount of the debt being stated at $3000. There was about $1000 worth of granite ready for the market. It is evident from the above statements, that the failure of the company was not owing to the expense of quarrying the stone, nor from its quality not being good, but it must have been caused by some other troubles unknown to me. It is probable that the debt will be paid, and the quarry redeemed, since it is really very valuable property, and is convenient for shipping.

Messrs. Redman and Tilden own the back part of this hill, and preparations were making by these gentlemen to open a quarry.

In Brooksville, opposite to Castine, occurs an abundance of pyritiferous slate, suitable for the manufacture of copperas and alum. This rock is cut through by numerous dykes of greenstone trap-rock, which doubtless were thrown up at the time, and by the same cause, that charged these slate strata with pyrites, for that mineral is most abundant in the immediate vicinity of the dykes.

There is also a remarkable dyke of compact felspar, which cuts through the strata in an E. N. E. and W. S. W. direction. The felspar is charged with large crystals of pyrites.

The slates run N. E. and S. W., and dip N. W. 70°. The pyrites is, in several places, laid with the most perfect regularity, in alternating layers with the slate, and owing to this admirable mixture of the two substances, it will form an excellent material for alum and copperas. It was, however, originally imagined by the English, during the late war, that a coal mine existed in this spot, for as coal frequently contains sulphur, they thought it probable that a rock containing sulphur must necessarily contain coal. Several other persons have since been deceived in a similar manner, and within a few years borings were made for coal. The auger penetrated to the depth of 100 feet, and brought up nothing but pyritiferous slate, as might have been anticipated. Borings were made in three or four different places with the same results. Now had this locality been a coal formation, as it certainly is not, there would have been no need of boring, for the strata stand upon their edges, or at an angle of 70° with the horizon, and no person, at all acquainted with the structure of the earth, would ever think of such an operation, for it would not give any information of the kind required. A geological observer can penetrate a thousand feet deep, when such is the position of the rocks, without digging into them at all. It is an open book that is laid before him, and he has only to observe attentively. Although coal is not found at this place, I doubt not that the rock contains so large a proportion of well-mixed pyrites, that it will work profitably for alum. I measured the extent of the kind of rock which appeared suitable for this purpose, and found that it occurs for 50 rods along the sea-shore, and runs back to an unknown distance inland. From its forming a cliff or ledge, rising immediately from the shore, it is evidently easy to work, since it can be broken up very readily, by means of gun-powder and the pick. Extravagant bonds have been sold for roofing-slate in this vicinity, but there is no probability of there being any rock suitable for this purpose. All the slate that we examined along the shores, was crooked in its stratification, and extremely rotten or fragile.

After visiting all the localities of any interest in this vicinity, we ran over to Belfast, and subsequently to Great Deer Isle, where we were desirous of examining the serpentine ledges, fragments from which had been sent to me. We first hove to by a little island near Cape Rosier, where there occurs a trap dyke, intersecting slates of various colors, such as blue, red, green and purple. We then ran over to Deer Isle, and called upon those gentlemen who were interested in the serpentine rock, and they politely accompanied us in our excursion, and gave us every aid. Near the landing, at the settlement, the rocks are gneiss, the strata of which run N. 55° E., and dip 80° S. E.

The serpentine occurs on the northern and north-eastern extremity of the island, of which it forms a considerable part. We traced this rock from Torry's Pond to the Reach, about 1½ miles in width.

In some places, we found it most beautifully veined with indurated asbestus, which gives a silky lustre to the polished specimens, and augments their beauty.

In other localities, the rock was filled with foliated diallage, giving yellow spots of changeable hue to the mass, when polished. Other specimens are of a deep olive green, and when polished appear like black marble. This rock is naturally divided into large blocks, about 3 feet square. It has a columnar arrangement exactly like the trap rocks, and was evidently, like those rocks, thrown up from below in a molten state.

There is some difficulty in estimating the value of this serpentine, and in giving an opinion as to the best method of quarrying it. It is soft, and easily cut, so that blocks may be morticed out in the same manner that the ancient Greeks were in the habit of quarrying their building stones. Or it may be split out by means of gun-powder, provided that large and deep holes are bored for the purpose, so as to give large blocks. It is certainly worthy of exploration, for the stone is a very beautiful kind of serpentine or verd-antique marble. By making a trial, and sending some of it to market, the cost of working it, and its value may be readily ascertained. I am now unable to give an

opinion of its statistical value. On Deer Isle we found a few veins of magnetic iron ore, included in serpentine, and saw numerous boulders and blocks of granite piled upon the serpentine, showing that they had been deposited there by diluvial action. We also found masses of grau-wacke slate, filled with impressions of terebratulae and other marine shells. These boulders were derived from the very centre of the State, and must have been brought hither by a diluvial current.

FOX ISLANDS. VINALHAVEN.

We crossed over to Vinalhaven, and passed into the strait called the Thoroughfare.

Landing on the north side, we observed a curious blending of broken masses of slate, by interfusion with greenstone trap-rock, a huge dyke of which occurs at this spot, and runs N. N. E.

We visited the land of Mr. Nathaniel Thomas, where we found two veins or narrow beds of anthracite, about an inch wide. They are found in a kind of conglomerated slate, which has been converted into hornstone by the action of the neighboring trap-rocks. These veins of coal are nearly vertical, and diverge from each other. It was extremely difficult to obtain a good specimen, since the coal crumbled when we struck such a blow, as was required to break the flinty rock. We obtained, however, enough to illustrate the fact that coal does occur in this rock. At Webster's Head, on the north end of the island, Capt. Dyer says that about a peck measure of the coal was got out and burned in a stove. These veins we do not consider of any statistical value ; but it is very remarkable that they should exist in so old a formation, and that they should have resisted the intense heat to which they have been evidently subjected. It is probable that they were formed from the remains of marine plants, since no land plants are found so low in the series. The reason why the coal was not burned by the action of heat, is evidently that the action took place at the bottom of the sea, where the oxygen of the atmosphere had no access. Thus, we see charcoal pass

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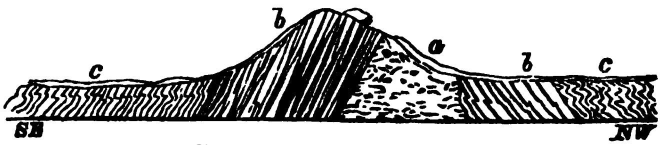
through an intense white heat, or even the temperature of melted iron, without change, where it is included in the slag.

After examining the various islands in Penobscot Bay, we ran in to Belfast, and made some measurements of the height of several hills in that vicinity. The hill in Belfast attains an elevation of 178 feet above the sea-level. Northport Mountain is 486 feet above the sea. This mountain is composed of gneiss, and on its side the granite appears protruding through the strata of that rock. The gneiss graduates away on either side, into plumbaginous and argillaceous slates, as represented in the diagram below.

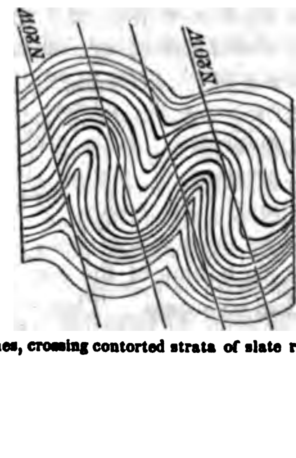


Northport Mountain, near Belfast.

a Granite.
bb Gneiss.
cc Argillaceous and Plumbaginous Slate.

From the summit of this mountain we have a charming view of Penobscot Bay, studded with beautiful islands, and skirted on the north and south by picturesque highlands.

On the western side of the hill are seen some very well characterized diluvial furrows, cut into the slate, which run directly across its curved strata, shewing that the grooves were produced by mechanical violence, and are not the results of disintegration of the rock. The following diagram represents this appearance.



Diluvial scratches, crossing contorted strata of slate rocks, Northport.

THOMASTON.

We revisited Thomaston, in order to learn the actual condition of the quarries, and the various improvements, which have been lately introduced in the art of lime-burning; besides which we made additional examinations as to the extent of the beds of limestone, there having been some progress made in developing the extent of the quarries, which could not be advantageously explored when we were last at Thomaston.

Since the last year, experiments have been made, for the purpose of ascertaining if more economical methods might not be devised in burning limestone, and the happiest results have been already attained. At the time we arrived, there were two good perpetual kilns in operation, the dust or skreenings of anthracite being used as fuel. By this improvement a complete revolution will be soon effected in the business at Thomaston, and in other districts, where wood has become scarce and dear. It has long been known, that it is profitable to carry Thomaston limestone to Boston, where it is burned in a similar manner to that now introduced in Maine; and when the demand for this substance begins to increase, as it soon will, for agricultural purposes, then the value of cheap methods of calcining the rock will be in great request. I shall endeavor to demonstrate in my Report on the Economical Geology of the State, the methods by which this may be done.

During the past year, there has been a great depression in the enterprise of our countrymen, owing to the difficulties in the mercantile world, and on this account building operations have been arrested, and consequently there has been a falling off in the demand for lime. Thomaston has, therefore, in common with other sections of the country, suffered some retardation in its prosperous career, but it has suffered less than almost any other portion of Maine. As the price of lime fell in the market, the price of the casks was also lowered, and the profit on the sales, that were made, remained about as usual. I am not able to state the exact returns for the sales made, at present, but shall be able to do so hereafter; partial returns I have at hand. We visited again the principal quarries, and took care

ful measurements of the various beds of limestone, so that we are now enabled to make an estimate of the quantity of limestone, which is accessible to the quarrymen. Since our last visit, the dolomite of the Marsh quarry has been uncovered of soil to a considerable extent, and the road is now complete, so that the rock may be advantageously wrought for lime.

We made various excursions to the hills and farms around for the purpose of collecting soils for examination, an also measured the heights of the hills. Dodge's Mountain is elevated 558 feet above the sea-level. The rocks are micaceous and talcose slates, passing into argillaceous slate, and are highly charged with manganese. The strata run N.E. and S.W. and dip 70° N. W. The soil on the top of the hill and down its western slope is very fertile, covered with groves of black oak trees, and its sides are clothed with good crops of clover, herdsgrass and grain. Specimens of the soil were taken for chemical analysis, and their composition will be seen in another section of this report. Black oxide of manganese forms from the decomposition of the manganesian slate, and this substance has been often mistaken for coal.

When we had collected all the information in our power, during our short visit to Thomaston, we ran down to Owl's Head, and examined the rocks near the Lighthouse. This remarkable headland is composed almost entirely of trap-rock, which has found its way from below sienite, through the strata of slates and limestones, to the surface, exhibiting many curious chemical changes, which are at once recognized as the effects of fire. The sketch below will give some idea of the appearance of Owl's Head, as seen from the Narrows.

View of Owl's Head Light.

I measured the height of this promontory above the sea-level, and found that the rock, upon which the lighthouse stands, is 81 feet 10 inches above high water mark. The Lighthouse is 14 feet high, making 95 feet 10 inches for the height of the lamps above the sea-level. The average rise of tide is 14 feet at this place.

Owl's Head is a favorite place of resort for people of leisure, and for invalids who require the refreshing sea-breeze for their health and comfort during the warm months of summer. At that season crowds of ladies and gentlemen take up their residence at the hotel, and scenes of gaiety and amusement serve to render the place quite inviting. It will, perhaps, be an additional and instructive amusement for visitors, to examine the curious rocks in the vicinity. It will be seen, that near the hotel, on the sea-shore, the trap-rocks are mixed with sienite, and evidently came from beneath that rock, for several dykes may be seen cutting through its mass. Visiting the cliffs on which Owl's Head Light stands, at low water, the spectator will have a fine opportunity of viewing the effects which were produced by the upheaving of a molten mass of rock into the strata around. The limestone included in the trap will be seen to have become white and crystalline, and the trap itself bears, in its cinder-like or scoria-form structure, evident

proofs of its fiery origin. The scenery is here interesting, and there is even something of the sublime in our emotions, as we look up to the overhanging crags, which here project into the sea and bid defiance to the storm. The crags attain an elevation of from 45 to 60 feet perpendicular height, and overlook the sea on their northern side.

Running down to Seal Harbor, we examined Otter Island, White Island, and the Seal Harbor granite rocks. These localities were wrought to a small extent a few years since, but are now abandoned.

Rackliff's Island is also composed of granite, but is not wrought at present. The whole peninsula of St. George appears to be composed of this rock, and quarrying operations have been commenced in several places.

In one of the neglected quarries I measured a columnar mass, that had been split out, which was 27 feet long, 5 feet wide, and 8 feet thiek, and consequently contains 1080 cubic feet, or $77\frac{1}{7}$ tons. This granite is composed of white felspar, black and grey mica, and but little quartz. The only difficulty said to have been met with, in quarrying it, is, that it proved rather tough and difficult to split, but from the appearance of the work that had been done here, I should think that the drill-holes were made too far asunder. It is certainly more easily wrought than the Quincy sienite, and the quantity of stone is inexhaustible. There are, however, so many easier granites worked, upon the coast of Maine, that I doubt if this quarry will be wrought at present.

There are several granite quarries upon the peninsular of St. George, which belong to the State. We visited them, and found that, generally, the rock split well, but the people resident there, said, that it lost its beauty when exposed to the weather, becoming "foxy," owing to the presence of pyrites. It is evident, however, that many of these quarries may be advantageously wrought.

White Head Island is the site of a light-house, and is composed of granite, with an enormous trap-dyke intersecting it near the sea shore. This dyke is 50 feet wide, and runs in an

E. by N. direction for half a mile, when it disappears beneath the ocean. Many lateral dykes are thrown out from this, and some curious phenomena in the history of these rocks may here be seen. The granite has evidently been torn asunder by violence, and its fragments are frequently imbeded in the mass of the dyke. This locality is another proof of what I have repeatedly said, that the trap-rocks came from below the granite.

White Head Light is 35 feet high above the rock on which it stands, and that is 23 feet above the sea level, so that the lanthorn is exactly 58 feet above the level of the sea.

The Atlantic granite quarry is near Rackliff's Island, and is now extensively wrought. A granite wharf has been built for loading vessels with the stone.

One of the State quarries is at Long Cove, and from that quarry, the stone used for the State Prison was chiefly obtained. The Bethel meeting-house in Portland is said to have been constructed of this stone, so also was the jail at Belfast. It splits well, but is said to become "foxy."

Last year, it is said, this granite sold in New York for 40 cents per cubic foot, rough-split. It sells at the quarry for 20 cents. It can be put on board vessels for 12½ cents per cubic foot, rough-split.

The Chaise quarry has been wrought to some extent, and the stone was sent to Delaware breakwater.

Fort Munroe was built from Seal Harbor granite, and a vast quantity of this stone has been sent to New York for sale.

The town of Friendship is also remarkable for the extent of the granite rocks around, and the quarries have been, and still are wrought to advantage. This granite is generally of a light color, containing white or grey mica, and it includes small blood-red garnets scattered through its mass. On the Southern part of Long Island, quarries are now wrought.

The quarries belonging to the State, near Seal Harbor, are the following:

Long Cove quarry, North from White Head Island.

Two Brothers' Islands, near Mosquito Island.

School-house quarry and Biscay quarry, near Cutter's Cove.

We met with many obstacles on this complicated part of the coast; and there are so many sunken rocks dangerous to vessels, that it is extremely hazardous for a stranger to cruise among the islands and ledges. Indeed, we could not find pilots resident on the spot, who dared to run our vessel to any considerable distance; so numerous are the hidden rocks, that no man can remember their bearings, and the charts, even if correct, would be of little service, where there is so little room to work the vessel. Spindles and buoys ought to be put on the South breaker, ¾ mile S. E. from White Head Island, and on a sunken rock, 4 miles to the N.E. of this island. Two buoys are also needed at the mouth of Seal Harbor.

The following diagram shows the trap-dyke cutting through the granite at White Head Island.

White Head Island.

a Granite.
b Dyke of Trap.
d Small lateral Dyke.

Pursuing our course westward, we came next to Herring Cove Island, where we found the rocks somewhat interesting. Hornblende-rock here prevails, and is cut through, five or six veins of granite, and by numerous veins of rose and milk-quartz. The veins all run uniformly North and South, and many of them include portions of hornblende-rock, shewing by this fact and by their cutting through that rock, that they were thrown up since its consolidation.

Franklin Island is composed of gneiss, which runs N. E. and S. W. and dips 70° S. E. It is of the porphyritic

variety, and is cut by veins of coarse granite, which run N. 10° E.

The island is the site of a light-house, and is a picturesque object as it presents itself in this little Archipelago.

The height of the light-house is 54 feet above the sea-level.

Pleasant Point, below Friendship, is composed of granite-rocks, as are nearly all the neighboring islands.

We ran down the coast of Bremen to Pemmaquid Point, but owing to the tremendous surf, we were unable to effect a landing upon that rock-bound coast. We were, however, able to discover, that the rocks are composed entirely of gneiss and granite, which form the whole extent of the promontory. Good granite quarries are said to exist near Broad Cove, but I have not yet been able to explore them.

Manhegan Island, which has a light-house erected on it, is also composed of granite.

The surf preventing us from exploring the islands around, we ran into Townsend Harbor at Boothbay. This place is one of the most frequented harbors on the eastern coast of the State, and is a favorite resort for invalids during the summer season, on account of the purity of the air, and the facilities for bathing in clear sea-water.

This harbor is well protected from the swell of the sea, and has an excellent light-house, placed at its entrance upon Burnt Island.

The following wood-cut will give a pretty correct idea of the entrance of this bay, as seen from the town.

View of Burnt Island Light, bearing S. 20° W. 1 1-8 miles distant from Boothbay village.

The rocks at Boothbay are not very interesting, being mostly coarse varieties of mica slate, gneiss and granite, the latter rock being found in veins traversing the gneiss.

We next ran to Cape Newagen, which we found to be composed of gneiss-rocks, the strata running N. E. and S. W. and dipping to the N. W. There are also veins of granite of a light color, intersecting the strata.

WISCASSET.

At this place, we examined a number of localities, where granite and gneiss are quarried. In the town, the gneiss may be observed near the court-house, where it crops out, and a vein of granite may be there seen, which runs N. 20° E. cutting through the strata.

On Squam Island occurs a kind of granite called granite-gneiss, the mica being arranged, so as to give it the appearance of stratification. This rock has been quarried for a building-stone, but not to sufficient extent to fairly test its quality. It is evident, however, from the appearance of the stone, where it had been opened, that it will be liable to turn rusty from the presence of oxide of iron, and pyrites.

Crossing over the island, we took a log canoe, and ran across

the river to Edgecomb, where a quarry of beautiful blueish gneiss has been wrought to a very considerable extent.

The rock is stratified in its structure, and runs N. 30° E. to S. 30° W. and dips 85° N. W. Its mica is black, and in such abundance, as to give the stone a dark hue. The extent of the present opening at the quarry, is 194 feet long, 63 feet wide and 18 feet deep. The largest sheets measured 27 feet long, 20 feet wide, and 6 feet thick. The average thickness of the sheets is from 1 to 4 feet, most of them being about 2 feet in thickness.

The distance of the quarry from ship navigation is only 400 yards, and the slope is 5° to the river. A good road has been made for the transportation of the stone, and the facilities for ship navigation are admirable.

Near the river, at the point, this rock again crops out, and may be seen standing in nearly a vertical strata. We also observed there distinct diluvial marks or grooves, upon the edges of the strata, which had just been uncovered of soil. Some of them are $\frac{1}{8}$ inch deep, and they uniformly run North and South, while the gneiss runs N. 55° E. and S. 55° W.

From this point, we measured the extent of the granite up to the quarry, and found it to be 1500 feet in length. The hill is elevated about 200 feet above the level of the sea, so it is evident that there is an ample supply of building materials on this spot. The rise of tide in the river is said to be from 13 to 20 feet. Ten feet from the granite wharf, the water is from 10 to 12 feet deep.

A large quantity of the Edgecomb granite has been sent to Portland, where it has been used in building the Exchange. It has also been sent to New Orleans. It is certainly a beautiful article, and by suitable care, stones of an uniform color may be obtained in great abundance. Those blocks which contain veins of lighter colored granite, should be laid aside, since they will not answer for the fronts of buildings, but will meet with a ready sale for door steps and posts.

After making a cursory examination of the vicinity of Wiscasset, we proceeded to Bath, where we remained several days,

occupied with the examination of the various localities of valuable building stones, and useful and curious minerals which abound in that vicinity.

There are several quarries of granite, which are extensively wrought.

Pitch-pine hill granite quarry, owned by Messrs. Winslow and Pratt, was opened in November, 1836, and has been in active operation ever since. The rock is granite-gneiss, and resembles that wrought at Hallowell. It works well, withstands the action of the weather, and meets with a ready sale. After making estimates of the value of this rock, which will be found in another part of the report, we visited Chandler's quarry, which is of a similar character with that just described.

NEW MEADOWS QUARRY IN BRUNSWICK.

This quarry is situate 3 miles West from Bath, in the South corner of Brunswick, at Howard's point. The rock is granite-gneiss, of good quality, and like the Hallowell stone, has a few minute red garnets scattered through its mass, which, however, do it no injury. I measured the extent of the rocks fit for quarrying, and found the hill to be about 85 feet high, and it extends North and South 90 rods, and to the same distance East and West. Nearly one half of this area may be successfully quarried.

The present openings are made at the height of 45 feet above the sea level, and the stone is dragged to the coast immedimediately below, where there is deep water, so that it is readily shipped and exported. The wharf is 600 feet from the quarry, and the slope is gentle. During the present year, 3000 tons of rougb stone have been sent to the Portland break-water from this locality, and 6000 tons more are contracted for, to be used at the same place.

PHIPSBURG.

We visited another quarry, ½ a mile South from Capt. Moses Morrison's house. The rock is granite-gneiss, and extends between 2 and 3 miles North and South, and is ½ mile wide.

This rock has been quarried and sent to Portland. There are, however, some improvements to be made, before it can be wrought to advantage. It is three miles from the waters of the New Meadows river. There is also a considerable rise of land between the quarry and the river, so that a road must be prepared for the easy transportation of the stone. It is estimated that a road, which would answer the purpose, would not cost more than $300. The hill is about 150 feet high above the sea level, and may be drained to the depth of 50 feet into the low land around.

While I was employed in the examination of these quarries, I sent the assistant geologist to Parker's Island, for the purpose of obtaining some specimens of the magnificent beryls, which were discovered at that place, some years since, by Mr. Abraham Hammatt, of Bath.

We then went to Phipsburg Basin, and obtained some good specimens of the rare minerals, which there occur in the limestone. Beautiful yellow crystals of cinnamon-stone garnet, egeran, pargasite, axinite, &c., abound.

We measured the extent of the limestone, and visited several granite and mica-slate quarries, in the vicinity.

The Phipsburg limestone is abundant and valuable, but is not at present wrought to any considerable extent. There seems to be but one difficulty in burning it, and that is, that much of it crumbles in the fire. Wood is also rather dear, but the rock may be shipped, and burned where it is wanted, by means of coal dust. It is a valuable article for agriculture, since it is very pure, and lies convenient for transportation.

The limestone breaks out again in the woods half a mile N. E. from this place, where there are numerous caverns found in it, which were produced by decay of the rock and the action of water. One of these caverns is ten or fifteen feet deep, by four or five feet in height, and the interior is covered with calcareous tufa. Those who may visit the localities at the Basin, in order to obtain specimens of the beautiful minerals, which we have discovered there, will succeed more read-

ily at the quarry in the woods, where it is easy to obtain specimens of egeran and garnet.

The Phipsburg limestone bed runs N. E. and S. W. It is 46 feet wide. When we had obtained a supply of specimens, and had collected all the information required, we went to the village of Phipsburg, where we were most hospitably entertained.

Our collections were put on board the Revenue Boat, which sailed down to Small Point Harbor, while I travelled there by land, for the purpose of examining the quarries lately opened for flagging stones. On Bartlett Lowell's estate, an opening has recently been made, so as to expose the strata of mica-slate, and slabs have have been split out, in order to test its quality. It was found to be too soft for a durable stone, and the strata were too much curved. Hence the quarry has been abandoned. The direction of the strata is N. 15° E. dip 80° Westerly. A little to the Eastward from this quarry, another opening has been made, where the stone is of good quality.—A number of platforms have been obtained, which are suitable for flagging stones.

A little to the Eastward of this locality, occurs another bed of mica slate of a more compact kind, and suitable for slabs for sidewalks. It is situate upon the farm of Messrs. Samuel and John Wildes, and has been operated upon, so as to show the quality of the stone. Slabs 15 feet long, 5 feet wide and from 2 to 6 inches in thickness, have been obtained. The rock is composed of grains of quartz and small plates of dark-green or black mica, with a few disseminated crystals of hornblende. Mica occurs in regular layers, so that the stone splits easily to the required thickness, and it is certainly as beautiful an article, though not quite so strong as that from Bolton, (Ct.)

It will be noticed that a long vein or bed of granite cuts through the mica-slate at this quarry, and runs N. 50° E. and dips 80° W. In some instances the strata of mica-slate are curved into semi-cylindrical forms, produced evidently by the upheaving of the granite. It will also be remarked, that the best flagging-stone is found near the bed of granite, and it is highly

probable that the slate was rendered more compact and solid by the intrusion of that rock.

The extent of this ledge is 1 mile in length; the width of the strata is unknown. It is elevated about 150 feet above the sea, and can be drained into the low lands around. It is probable that this stone will be wrought advantageously, since it is a beautiful variety, and an article of value in our cities. The situation of the quarry is three quarters of a mile E. N. E. from Small Point Harbor, and two miles West from the fort on Hunnewell's Point. It is probable that by making openings elsewhere upon the peninsula, good mica-slate may be obtained.

At Portland we took leave of the Revenue Boat, and travelled along the remaining sea-coast by land, stopping long enough to determine the character of the different rocks. We first made an excursion to Jewel's Island, for the purpose of inspecting the copperas and alum works, which have been established there. These substances are manufactured from the pyritiferous slate. The sulphuret of iron or pyrites decomposing, forms sulphate of iron or copperas, and the remaining sulphuric acid uniting to the slate, or alumina, forms sulphate of alumina, to which salt a little sulphate of potash is added to form alum. There is a considerable difficulty to overcome in working this rock, for it contains talc, principally composed of magnesia, which is an article not wanted in the operation, and is difficult to separate from the alum.

Jewel's Island has long been a place of some celebrity, on account of the pyrites, which was formerly supposed by many to be gold, silver, or an indication of coal mines! It is not worth while to enter into the history of the various absurd operations, which have been carried on here by ignorant or artful imposters.

The pyritiferous slate on this island occurs disseminated in the rock and in narrow veins, and is found in abundance near the alum works. There are two dykes of greenstone-trap, which cut through the slate, and run E. N. E. and W. S. W. and dip to the S. S. W. 60° It is probable that these

dykes have had some influence in charging the slate wi rites, since we generally find the mineral near rocks c character. These dykes no not appear continuous with upon Cape Elizabeth, for that place bears S. W. by S Jewel's Island, and it is more likely that they run the main land just below Portland Light.

The following wood cut gives the outlines of Cape Eli as seen to the W. The rocks are entirely composed of ified talcose slate, with two large dykes of trap cutting tl its mass. The talcose slate is here remarkable for sı into long masses which are used like rails for walls and f

View of Cape Elizabeth Lights, bearing West.

On Crotch Island are numerous clefts in the talcose filled with veins and crystals of quartz. The strata rı 52° E. and dip E. by S. 75°. A trap dyke here a tersects the strata, and runs S. W. by W.

We ran close under a number of islands which are ger composed of similar rocks to those above described.

Returning to Portland, we engaged a horse and wag our cruise Westward, and travelled along the margin sea to Kittery Point in York, stopping at those places the rocks could be seen, and obtaining specimens. B section I was also desirous of completing our outline sur

the sea-coast of Maine, so as to record the various rocks, upon a map prepared for that purpose.

The rocks extending entirely from Portland and Cape Elizabeth, to Saco, are composed of the various slates which I have formerly described as metamorphic, or such as have undergone changes in their structure, and chemical and mineralogical composition, from the agency of heat, which emanated from the igneous rocks below. Thus it will be seen that the argillaceous slate-rocks insensibly and gradually change into mica-slate, as they come in contact with granite, and where they contain magnesia, they become talcose slates, and so in accordance with their chemical composition, and the laws of igneous action. Since this subject will be more fully explained hereafter, I shall now refrain from theoretical inferences excepting when called upon to assign the rationale of the phenomena which I record.

In Scarboro' the strata of talcose slates run N. N. E. and S. S. W. and dip W. N. W. 70° Scattered crystals of iron pyrites occur in it here and there, and it is occasionally glazed with plumbago or graphite, hence it has been vainly imagined that coal would be found in this rock.

Near the brook crossed by the road to Saco, may be seen numerous diluvial scratches which appear upon the surface of slate, and run from N. 5° W. to S. 5° E. coinciding very nearly with the direction of the grooves before noticed. On the right hand side of the road to Saco, there are two trap-dykes, one of which is 2 and the other 4 feet wide. At Saco, we examined a locality where a little bog iron ore has been found on the land of Mr. Wm. Cutts, 1 mile N. W. from the village.

On reaching the town of Biddeford, a little West of the Saco river, the granite is seen to protrude from below the slate-rocks, which are altered in the manner to which I have formerly alluded. Here the argillaceous slate may be seen to pass directly into mica slate, where the two rocks come in contact. In one place the granite is seen protruding directly through the strata.

A beautiful dark colored granite occurs upon the estate of

ing to its inequality of shades it may perhaps l furnish a large supply of uniformly colored stc locality. No quarries have yet been opened th is now impossible to decide this question, since rock is still covered with soil. The area of Hill' is nearly 10 acres and the rock shews itself in 14 ces on the farm. Blocks of good stone from 4 tc by 4 feet in width, and 1 foot in thickness, have obtained. I am of opinion that this locality will fu tiful building-material, but not in large quantiti land is not elevated sufficiently for the purpo hard kind of slate passing into fine quartz rock on this farm.

KENNEBUNK.

Proceeding westward, our next object was to exar ite on the sea-coast, at the Ocean Quarry, Kennebun dark colored variety, with a hard white felspar a ca well mixed, and it is of the same variety as that v Kennebunk U. S. Quarry. It forms a mass risir 20 feet above high water, and runs back under

Goose Rocks of Cape Porpoise. The land is elevated about 30 or 40 feet, and slopes gradually to the sea. In order that this rock may be transported directly to the sea-shore, a road is required across the marsh, which should cost from 2 to $300. Since it would be difficult to drain cheaply below the depth of 20 feet, I doubt if this quarry can be wrought extensively.

The U. S. quarry in Kennebunk, belonging to a company, has been opened to a considerable extent. The granite is of a dark color, owing to an abundance of black mica which is well mixed with the other mineral components. Its felspar is remarkably hard, transparent and white, and breaks with a glassy fracture. The quartz is in comparatively small proportion. It is owing to the hardness of the felspar that the rock is so firm in its texture. There is a little sphene, an ore of titanium, scattered through it in minute wedge-shaped crystals. This mineral, however, does no harm, since it does not decompose. There are a few minute cystals of iron pyrites scattered through the rock, and generally in contact with the mica. Owing, however, to the dark color of the stone, the spots produced by its decomposition do not become apparent, as may be seen in many of the buildings where it has been used. The hardness of the felspar crystals also prevents the action of pyrites on the rock, since its cohesive force would retard chemical decomposition.

This quarry is elevated 75 feet above the sea-level, and is 3 miles from the wharf at Kennebunk-port, where the stone is shipped.

The following measurements were made of the present extent of the openings which are now wrought. First quarry, 50 feet wide, 15 ft deep. The second, at the canal, 75 ft wide, 10 ft deep. It is not found convenient at present to drain the quarries below the depth of 20 feet. A decomposing dyke of a peculiar kind of trap-rock, which is easily extracted, materially aids the drainage. This dyke is 6 feet wide, and runs N. 55° W. When it was discovered, it was found to have decomposed to the depth of 12 feet, and the ravine was filled with diluvial boulders and soil. This dyke forms a good "heading" for the quarry, and advan-

tage is taken of it for that purpose. One of the blocks of stone which has been split off from this head by means of drill holes and wedges, measures 28 feet long, 6½ feet wide, 4½ feet thick and weighs 64 tons.

Enormous quantities of rough-split and hammered stone lie around the quarry and on the company's wharf, at the Port.

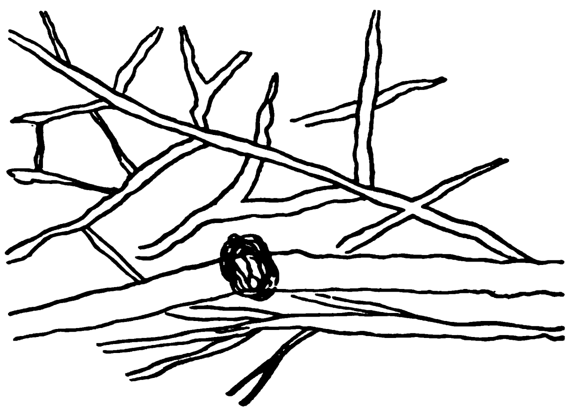
No less than 2000 cubic feet have been exported and sold at New York during the past summer.

It is well known that a thriving trade is carried on in Kennebunk from sales of granite, and that many hands are constantly employed in the work.

At the Port, near the Granite Company's wharf, may be seen a large trap-dyke, which cuts through mica-slate and runs N. E. by E.

On the road from the Port to Kennebunk village occur a great number of dykes, which cut through the strata of mica-slate in a N. E. by N., and S. W. by S. direction. One of them is 50 feet wide, and may be traced to a great distance through the fields on either hand.

Some very curious reticulated veins of blue quartz occur in the mica-slate on this road, and were probably formed at the time, when the neighboring dyke was thrown up. [See wood cut.]



Quartz Veins.

On the sea-shore at Kennebunk, we observed a great number of curious dykes which have been thrown up through the granite, and a peculiar kind of green and blue hardened slate. Some of them have evidently been dislocated or broken, since they were injected and hardened, and other dykes cut across them in such a manner as to shew two distinct eruptions. The general direction in which the main dykes run is E. N. E. and W. S. W., while the cross dykes run North and South. I shall presently be enabled to show three or four distinct epochs in the eruption of these igneous rocks.

It will be observed that the slate-rocks, where they are intersected by trap-dykes, are hardened into a kind of green flinty slate, while more remote from them, the slate is less hard, and has the appearance of novaculite, or hone-stone, presenting various stripes of blue, brown, and green colors, which run in the direction ofthe strata. It is here too hard for hones and oil-stones.

Several specimens of rose quartz were shown me which were obtained at Cape Porpoise.

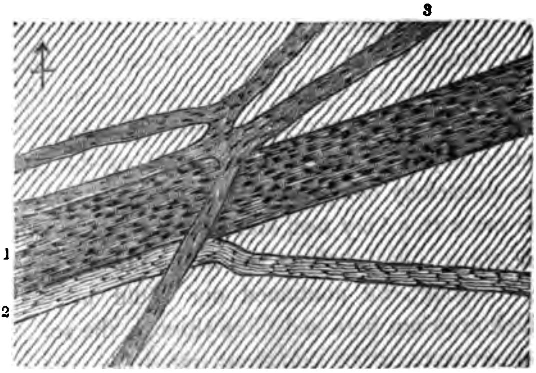
Learning that Daniel Sewall, Esq., a gentleman of science and an accurate observer, was in the habit of keeping a register of his barometer and thermometer, for meteorological purposes, I took occasion to request his services in behalf of the State, when he most cheerfully complied with my request, and has since furnished me with a very neat and well arranged meteorological table, which is laid before you in the present report.

Leaving Kennebunk, we continued our route to Wells. The rocks which crop out here and there through the soil, are strata of indurated slate, cut by numerous trap-dykes, some of which are porphyritic with crystals of felspar. A little bog iron ore is found in Wells, and slate-rocks abounding in pyrites also occur. The soil is generally sandy, and was evidently derived from decomposed granite.

Half a mile West from Maxwell's hotel, we examined a hill of sienite, which extends N. E. and S. W. ½ mile, and ¼ mile in a N. W. and S. E. direction, and rises 70 feet above the sea-level. This sienite is composed of a deep bluish-green

felspar, colored by the protoxide of iron, black crystals of hornblende, and a little quartz. It contains, in every place where we could examine it, so much iron-pyrites, as to cause its rapid decomposition, which destroys its value, as a building material. It is certainly worth while to explore it more extensively, but it cannot be done without considerable labor, since its surface is always decomposed, presenting a deep brown color, while its "sap," as the quarry-men call it, extends into the stone, to the depth of 8 or 10 inches from the surface. There is one place where a block may be split off for trial, to the extent of 81 feet in length, by 6 feet in thickness, and this may be done at little expense, and will show its quality, where it has not been affected by the weather. Should it prove to be of good quality, it can be advantageously quarried, since it is but ¾ mile from the sea-shore, and the slope of land is gradual.

On the road from Wells to York, we met with numerous trap-dykes of great dimensions, which generally traverse the slate-rocks in a N. E. by E. and S. W. by W. direction, and are mostly of the porphyritic variety.



Trap-dykes of three eruptions.

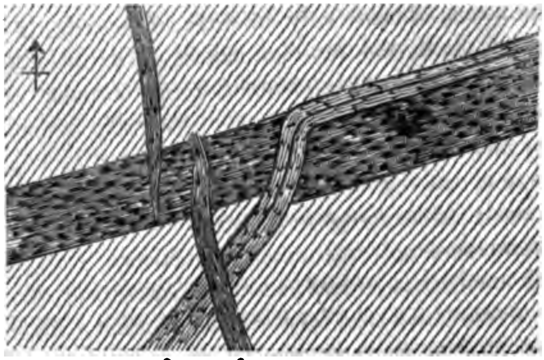
YORK.

There are many singularly obscure rocks in this town, and every variety of metamorphosis which slate rocks can undergo, may be observed. Sienite veins and trap dykes, of various ages, occur in great numbers, cutting across the

strata, and furnishing an index to their history. One of the sienite veins runs N. E. and S. W., and is seen intersecting the indurated slate. This vein is again cut off by a small trap dyke, running N. and S., which is a lateral dyke belonging to a larger one to the north, which is 3 feet wide, and runs N. E. by E. and S. W. by S., and dips 70° N. W. The slate is extremely hard, and non-fissile, and is striped with blue and brown colors.

The most remarkable phenomena may be seen at Bald Head, a singular promontory which runs out into the sea, presenting a huge overhanging mass of rocks, against which the ocean waves dash with tremendous fury. These rocks are composed of a most beautiful variety of striped novaculite, or hone-slate, the strata of which are cut through by an infinity of dykes. There are also a great number of veins of milk-white quartz, which traverse the strata. The hone-slate runs N. E. and S. W. and dips 80° N. W. It is a valuable material for fine hones and oil-stones, and remote from the intersecting dykes, it is soft enough for this purpose, while near them, it is so hard and flinty, that it will not answer, excepting for the hardest kind of whet-stones, used in sharpening lancets and other fine instruments.

Our excursion to Bald Head was exceedingly instructive, since we there discovered the relative ages of most of the trap-dykes, the directions of which we had before been accurately recording, knowing that if we put down exactly what we found in nature, some useful instruction would certainly result.—Here, then, to our surprise and gratification, we met with absolute proof of their different ages, a result which I had only hoped to have obtained after a long research. This locality solved at once, by absolute demonstration, this important problem; for here we saw the various dykes cutting across each other, in such a manner, as to prove their several different eruptions. It will be seen in the following diagrams, how three distinct intersections are presented.



Intersecting trap-dykes of three eruptions.

The first eruption was that of the porphyritic greenstone-trap, (1) which was thrown up in the form of large dykes, after the consolidation of the slate-rocks, and run N. 55° E.

The second series (2) cut the porphyritic dykes off in the above manner, and even dislocated them, and turned one portion of the older dyke out of place. They run N. E. and S. W., but are quite irregular.

The third cutting (3) is effected by another series of dykes of a brown scoriacious trap, which cuts off the second series; hence we have three distinct eruptions of these rocks, each taking place after the consolidation of the preceding series.

We have recorded, also, several other series of dykes, differing in direction from those, and hence we may now confidently affirm, that four or five distinct eruptions of molten trap-rocks have burst through the strata of Maine.

Persons unacquainted with the science of geology, will perhaps ask, what use it is to observe and record such observations as these, since the trap-rocks are seldom of any commercial value? I reply, that all facts in nature are useful, to an extent we do not at first apprehend. These discoveries advance the science a step farther in its progress, and who will venture to calculate the importance of the results, which will follow? Any fact which throws light on the history of the great rock formations of the earth, is of immense value, and may

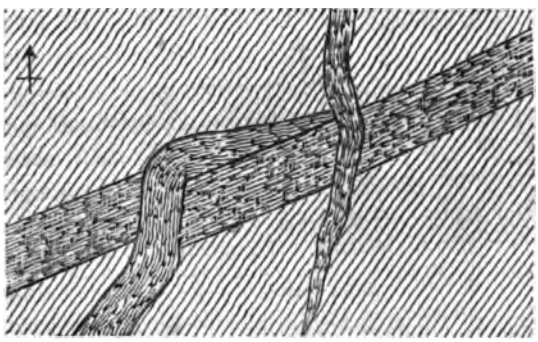
serve as the means of many very important discoveries of valuable minerals. Even the little information which the Cornish mines in England have given, respecting the intrusion of the dykes, serves there as a clew to the discovery of valuable veins of copper, tin and iron ores. Such will be the result in Maine, and to as much greater extent as the facts are well observed and recorded for future reference.

It will be remembered, that around the shores of Lubec bay, we generally found veins of lead, zinc and copper ores, directly beside the dykes ; and in Nova Scotia likewise, the most valuable beds of iron ore are found in the immediate vicinity of similar rocks, while at Cape Dor, in the same province, we find an abundance of rounded (evidently once molten) masses of copper, in the mixture of trap-rocks with the new red sandstone.

Let us, then, carefully record all facts which we discover, and look confidently forward for some useful result. Already we are enabled to account for the abundance of pyrites, or sulphuret of iron, in the slate-rocks of Maine, by the effects produced upon them during the protrusion of molten rocks from below.

One of the widest dykes at Bald Head, measured 55 feet in width, and they extend to a great distance in the directions N. 60° E. and S. 60° W. The smaller measure from 1 to 6, 8 and 10 feet in width.

2



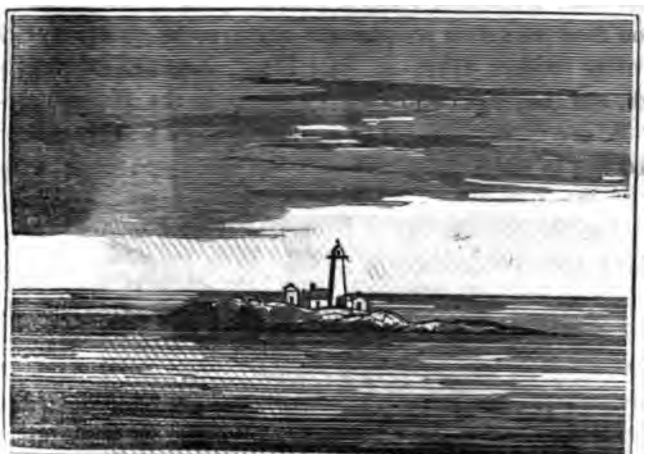
2

Trap-dykes of two eruptions, Bald Head, York.

After collecting a series of specimens, illustrative of the

phenomena which we had observed, we set out for an excursion to the Agamenticus Mountains, in company with Col. Brooks and Mr. Emerson, who kindly tendered us their assistance. Agamenticus hills are three in number, and are distinguished by their numerals, 1, 2 and 3, the highest being No. 1. To this mountain we directed our course, after ascertaining the height of the barometer at the sea-level, one chief object being to determine the altitude of these mountains, which form conspicuous objects for the guidance of the navigator.

By inspecting our barometrical tables, it will be seen, that the sea-level barometer stood at 30.300 inches, temperature of the instrument being 62°. On the summit of the highest mountain, it stood at 29.567 inches, temperature 69°. Calculating from the elements, we have for the altitude of the mountain 672 feet above the sea-level. From its summit, we have a beautiful panoramic view of the sea, and of the surrounding country. Boon Island is seen to the S. 59° E. Cape Porpoise, N. 75° E. York meeting-house, S. 11° E.



View of Boon Island, seen through a telescope bearing S. E. by E. from Cape Neddock, distant 9 miles.

Agamenticus is composed entirely of sienite rocks, but since they have not been quarried, and it is extremely difficult to obtain a fair sample of the rock, without blasting, we

were not able to form a correct estimate of its value, as a building material. It is also probable, that even were the stone found of excellent qualities, that it cannot be transported to the harbor, at a sufficiently low price to render quarrying profitable.

Leaving the first peak, we travelled to Agamenticus No. 2, where the barometer stood, at 4, P. M.=29.636 inches, temperature=62°. Height of the mountain is 525 feet.

Black oxide of manganese and bog iron ore, are found in small quantity at the mountain's base, and have been mistaken for indications of coal. It is hardly necessary to state, after giving an account of the geology of the country around, that it is utterly impossible for coal to occur there, since the whole mass of rocks are aggregates produced by fire.

KITTERY POINT.

This promontory forms the extreme Western boundary of Maine, and is directly opposite Fort Constitution upon New Castle Point in New Hampshire. The rocks are indurated varieties of argillaceous passing into micaceous slates, which run N. 70° E. and dip N. W. by W. 65° Several trap dykes cut through the strata, and nearly coincide with their direction. The only simple minerals found there are quartz and iron pyrites, which occur in veins or in scattered crystals. The slate is a solid material for rude architecture, and is suitable for wharves, breakwaters, stone walls, and perhaps for flagging-stones, but since it has never been quarried, I do not know whether it will split true enough for the latter purpose.

After examining this point we crossed over to Portsmouth, and the next day set out for our section along the western boundary of the state.

Travelling up beside the river to Berwick, along the State line to Newfield, we noted on our map the various rocks which were traversed. I had previously made several excursions to the White Mountains, and knowing the character of the rocks above Newfield, did not think it needful for our immediate purpose to proceed further up the New Hampshire boundary. I then took a line of observations from Newfield, eastward to Augusta.

At South Berwick occurs a bed of the upper tertiary clay, like that at Bangor, and contains similar fossils. This deposit is elevated 40 or 50 feet above the level of the river in Berwick, or about 100 feet above the level of the sea.

North from Berwick the soil becomes more sandy, and evidently resulted from the decomposition of granite rocks, since it is full of spangles of mica, and the other ingredients of granite.

On Salmon river, at the falls near the factory, may be seen slate-rocks, like those noticed at Kittery Point. The strata are contorted, but run generally N. E. by N. and S. W. by S. and dip E. S. E. 70° a 80°.

Salmon Falls are produced by the ledges of this rock, and the river rushes down over their out-cropping edges, with great force, and whirls its foaming waters over their rough and craggy surface. The first pitch of water is 14 feet, the second is 20 feet fall.

A new and elegant factory has just been erected on the N. Hampshire side, upon the ruins of one which formerly stood on the spot, and was destroyed by fire three years ago.

We were informed, that bog iron ore is found about a mile West from the factory, but we thought it would be unnecessary for us to explore it, since it is beyond the limits of Maine, and would not, if wrought, be carried through her territory.

Proceeding onward, we found mica slate, of good quality, for flagging-stone, on the road to Lebanon. Boulders of granite occur abundantly in the soil. Lebanon is an elevated table land, or extensive plain, attaining an altitude of 515 feet above the sea-level, and composed of a poor sandy soil devoid of any clay substratum. Here and there occurs a hard pan of gravel cemented by means of bog iron ore, which serves in some measure to compensate for the absence of clay, retaining the water and nutritive matters within reach of the plants.—This whole district is almost entirely devoid of forest trees, and the soil is very sterile. Indian corn here and there grows,

but it is generally short and feeble. There are but very few spots in this district where any compensation is made by the soil, for the labor bestowed upon it, and the people, generally, have great difficulty in supporting themselves by farming. Wood is also scarce and dear, which shows improvidence in the first settlers, who destroyed the native forest trees, the only produce which can advantageously grow on such soil.

From the elevated lands of Lebanon, it is said that the sea may be discovered on a clear morning; but we were not so fortunate as to have a good view, on account of the fog which lay in the horizon, and appeared like a boundless ocean, while in the interior, the hills on Salmon river, the plain of Rochester, and the Bonny-big hills of Sanford appeared like islands seen in its midst.

The only rocks in place, at Lebanon, are alum and mica slate, the former being the result of decomposition of pyrites. The mica slate runs N. and S. and dips 60° W. This rock is a handsome material for side-walks, and sheets of proper dimension, will sell in Boston for 33 cents per superficial foot. The cost of transportation to Portsmouth is estimated at $4 per ton, the distance being 30 miles.

On the road to Acton, we observed granite rocks, of a coarse variety in place, farther on we came to mica slate charged with pyrites, and cut through by a dyke 15 inches wide, running N. E. and S. W. Near Shapleigh, we came to good mica slate, suitable for flagging-stones. The strata of this rock are cut by several coarse granite veins.

ACTON.

The soil in this vicinity appears to have been derived from the decomposition of granite-rocks. It produces about 15 bushels of rye to the acre, and about 25 bushels of indian corn.

On reaching Newfield, I called upon Dr. L. J. Ham, who kindly volunteered his assistance during our stay in that place. With him we visited the iron foundry at Shapleigh, on the corner of Newfield, and examined the extent of the ore which is found in that vicinity. The bog iron ore is found upon the lit-

tle Ossipee river, in Newfield, and is of a very good quality, yielding from 40 to 45 per cent. of excellent cast iron. It occurs at the head of a pond South West from the furnace, in a peat swamp. Of this low land, about 15 acres belong to the iron company, and the ore has been traced about 100 yards back from the South bank of the river. Its longitudinal dimensions have not yet been ascertained, but it appears to be a very extensive deposit. The order of layers I found to be as follows.

A thin layer of peat occurs on the surface, below which there are of

Shot ore,	8	inches;
Pan "	14	"

The bottom is white siliceous sand.

Three men can dig 7 or 8 tons of the ore per diem, and deliver it at the works.

The furnace was erected last year, under the direction of Mr. Thomas Bates, of Bridgwater, Mass. It is of small size, and cost but $11,000. It was put in blast on the 9th of August, 1837, and has furnished about 1¼ tons of iron per diem. The works appear to be profitable to those concerned, and will be prosecuted vigorously. Formerly, seashells were carried from the coast, to supply the furnace with lime for a flux, but since that time, limestone sufficiently good for the purpose has been discovered in abundance, in the immediate vicinity, and will save the expense of transporting shells. The furnace is 36 miles from Portland, 24 miles from Wells, and 25 from Kennebunk. The iron will be sent to Boston by the way of Wells or Kennebunk.

I shall give the statistics of this foundry in a subsequent chapter, and therefore dismiss the subject for the present with this remark, that it is highly probable, that many immense and valuable beds of bog iron ore lie concealed in the low lands and swamps of Maine, and that it will be of great importance to the State, to have them discovered and wrought. I beg leave, therefore, to call the attention of those interested in this busisiness, to the lands into which flow ferruginous waters from

the pyritiferous slate-rocks, so abundant in the State, since bog iron ore is constantly and rapidly forming in such places, and many deposits may be found sufficiently extensive to warrant the erection of blast furnaces.

The manner in which these deposits form, may be seen at a glance, in looking upon the rusty sediment which is deposited by springs, which run out from the hill-side, and deposit iron ore in the meadows below. On looking at the ferruginous springs of Bluehill, or at Castine, it may be seen how rapid this deposition takes place.

It is evident, from the number of specimens brought to Augusta by members of the Legislature, that this ore is widely spread in the soil of Maine, while in many places it occurs in so large beds, as to prove valuable to the country. In exploring the extent of a bed of bog iron, you have to ascertain its length, width and depth, by which you may calculate its cubic measure. If two lines are run crossing at right angles, through the midst of the deposit, and the depth of ore is sounded by digging, and by the iron bar, there will be no difficulty in making a fair estimate.

Any locality which can keep a furnace supplied with from two to three tons of the ore per diem, may be deemed ample for the purpose, and allowing that other things are favorable, Iron may be made profitable. In general, charcoal should not cost more than 6 cents per bushel, at the furnace, and frequently it can be furnished for half that price. It is also important that water power should be at hand, to blow the furnace bellows—sometimes however, steam power may be used instead.

After examining the Newfield Iron Works, and obtaining all the statistical information in our power, we visited Thyng's mountain, on the summit of which occurs a large trap dyke, which has been mistaken for a vein of iron ore. This mountain is not less than 1700 feet above the sea-level, and is composed of sienite rocks. The dyke which cuts through the mountain, runs N. E. by E. and S. W. by S., and is 30 feet wide. It runs across another hill and continues its course towards the iron furnace, where it again makes it appearance. From the

summit of this mountain we have a magnificent view of the Alpine country around—Ossipee, Davis, Bonds, and several other high mountains are seen nearly on a level with this peak.

Davis' mountain is composed of granite rocks, and on its sides occurs the gneiss which alternates with numerous narrow beds of granular carbonate of lime. This limestone by disintegration serves to enrich the neighboring soil, and if burned, would form a most valuable manure. Arsenical pyrites abounds in the granite, occurring in narrow veins.

Bond's mountain is also composed of granite, and there are found numerous veins of arsenical iron which has been frequently mistaken for silver ore. It is a mineral of some value, as it is a rich ore of arsenic, and may be used in the process for manufacturing shot. Columnar greenstone-trap occurs also on this mountain. Hydrate of silicia, a white mineral, frequently mistaken for, and sold as magnesia, is found abundantly in the low grounds of Newfield, and may be used for the manufacture of fire brick.

Fuller's earth occurs on Davis' farm in the South West part of Newfield, 2 miles from the S. W. corner of the town. This mineral was formerly dug for the supply required by factories and fuller's mills, but it is now abandoned, owing to a decline in the demand, new processes in the art having taken the place of this earth. It was formerly sold for $30 per ton, and was discovered twenty years ago, while digging for an imaginary silver mine.

Limestone suitable for agriculture abounds on this estate. It alternates with strata of gneiss, which run N. E. and S. W. and dip 30° S. E.

Near Limerick at Fogg's Mills the lime-stone is again observed and the dip is changed to the S. W. 20°. Several large trap-dykes here occur, five of which were measured, the widest of which is 30 feet broad, and the direction of the whole series is N. 55° E.

In Limerick we examined the peat bogs on the estate of Mr Ebenezer Adams, where a very remarkable substance is found resembling exactly the Cannel coal. It is found at the depth

of 3 feet from the surface of the peat bog, amid the remains of rotten logs and beaver sticks, showing that it belongs to the recent epoch. The peat is 20 feet deep, and rests upon white silicious sand. This recent coal was found while digging a ditch to drain a portion of the bog, for the sake of obtaining peat as a manure ; about a peck of it was saved, and served to supply us with specimens. On examination, I found that it was formed from the bark of some tree allied to the American fir, the structure of which may be readily discovered by polishing sections of the coal, so that they may be examined by the microscope.

It contains in 100 grains.

Bitumen	72
Carbon	21
Ox. Iron	4
Silica	1
Ox. Manganese	2
	100

This substance is a true bituminous coal, containing more bitumen than is found in any other coal known. I suppose it to have been formed by the chemical changes supervening upon fir-balsam, during its long immersion in the humid peat.

The discovery of the recent formation of bituminous coal cuts the gordian knot which geologists and chemists are endeavoring to unravel, and shows that the process is still going on. The difference between bitumen and resin is not very great, and the absorption of a small quantity of oxigen is all that is required to effect the change. Other localities of this curious substance, may be found by searching the numerous peat bogs in other parts of the State. The fact is of immense importance in explaining the origin of coal, and the results of any advancement in our knowledge of this science cannot fail to have a most useful tendency. Peat is very valuable, but is too generally neglected. It may be made to serve as a substitute for wood or coal, and when properly prepared and burned it is a pleasant fuel. It burns well in an ordinary coal grate, and when the

chimney has a good draught, does not give any unpleasant odour to the apartments. It may also be used, when it is abundant, for the burning of limestone intended for agricultural use, and its ashes, mixed with the lime, are valuable as a manure. Since the pressure of the charge might interrupt the burning of peat, some layers of wood ought to be interposed in preparing the kiln. Temporary kilns may be constructed of large size, of any rough stones at hand, and lime may be burnt well enough for agricultural purposes in three days. Throughout York and Oxford counties, there occur abundant beds of limestone, and peat also abounds.

Luxuriant artificial meadows are made, by carting sand and clay upon peat bogs, so as to cover the surface, and then by treating the soil with a few casks of lime to the acre, an evergreen meadow is formed.

Beneath the peat of Limerick occur valuable beds of hydrate of silica, a substance which has been there mistaken and sold for magnesia. It may be used for fire brick, and for a dressing to soils. It is full of vegetable juices, and possesses fertilizing properties to a degree not fully apprehended by farmers. It has the property of attracting and giving off the moisture of the atmosphere, and by this means, also, serves to vivify the vegetation growing upon it.

Bog iron ore occurs on the road from Limerick to Parsonsfield, on the estate of Mr. John Moore, and it is also found half a mile west from the Seminary, but to what extent, I am unable, at present, to decide.

In Parsonsfield we found an abundance of a rare variety of egeran, and beautiful crystals of yellow garnet, pargasite, adularia and scapolite. They occur in a granular variety of limestone, which is scattered in profusion, in the fields near Dr. Swett's house.

In a stone wall, north from Stackpole's Tavern, we obtained some beautiful specimens of these minerals which are found in angular boulders of granular limestone. Proceeding North 15° West, the number and size of the boulders is said to increase; and when I pointed in that direction, Mr. Swett remarked that he

had found them along that line. Hence, it is probable that the parent bed of limestone lies in that direction.

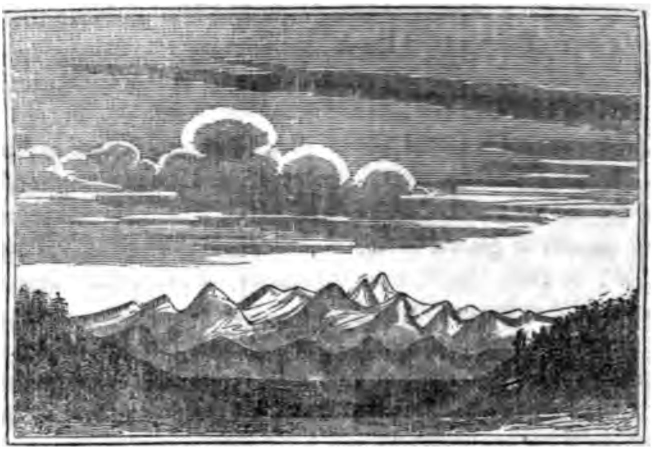
At Blazo's Corner, occurs a trap dyke 5½ feet wide, running in a N. W. by W. and S. E. by E. direction.

At Kezar's falls, near Gibbs' tavern, a vein of lead and zinc ore has been found. Pits have been sunk to the depth of 30 feet for the purpose of obtaining lead. The vein is included with quartz, in granite rocks. It runs N. 8 or 10° E. and is said to show itself near Denmark, 2 miles East from the corner of that town. This locality was originally discovered six years ago, and was wrought by Gen. Ripley and others. It was found unprofitable, and is now abandoned. The hardness of its matrix is one of the greatest obstacles to overcome in working it for lead, and the ore not being more than two inches wide, renders it extremely improbable that it will ever be wrought advantageously. It is not improbable that other and wider veins will be discovered. The minerals associated with the lead ore are sulphuret of zinc and pyrites. These minerals are of no value except in very large quantities.

Magnetic iron ore has been found in small quantity near Porter on Partridge's Mt. in Brownfield. Specimens were presented me but I had not time to visit the locality.

From Cornish to Hiram along the course of the Saco, we have very picturesque scenery, not unlike the mountainous districts along the Connecticut river. Abrupt crags of granite and gneiss rocks, in some places, almost overhang the road; high diluvial embankments are also seen, and the river meanders most beautifully amid the hills and intervales.

The following sketch presents an outline of the Alpine scenery viewed in the N. N. W. on the road from Hiram to Denmark.



View of the Mountains to the N. N. W. from the road between Hiram and Denmark.

In Denmark, there is a remarkable eminence, which shows itself in the rear of the village, called Pleasant Mt. Its highest point bears N. 37° W. from Mr. Ingalls' house, from which it is about 3 miles distant.

View of Pleasant Mountain in Denmark, bearing N. 37° W. 3 miles distant.

The route from Parsonsfield to Denmark, and from thence to Waterford, is very picturesque, and of an Alpine character, presenting groups of mountains rising abruptly, one behind the other, in the distance, while small, but beautiful lakes are seen

here and there amid an amphitheatre of hills. An artist would find ample scope for his pencil in sketching this interesting panorama.

At Waterford, we called upon Mr. William Coolidge who shewed us great hospitality and guided me to a number of localities worthy of examination.

On Maj. Stone's farm, Mr E. L. Hamlin discovered many years ago a curious rock, composed of phosphate of lime and quartz. Also a fine crystal of richly colored amethyst. It was not attached to rock, and probably was out of place, since no more have since been discovered there. Mr Coolidge presented me with a mass of lepidulite like that of Paris which he found upon his farm.

Hawk Mountain is composed of granite, and presents a lofty mural escarpment, shewing the appearance of a slide from the cliff. This precipice is cut across by a huge but inaccessible dyke, that may be seen from the road below.

I obtained specimens of all the most remarkable soils on my route, and examined particularly those obtained in Waterford, where the farms are in thriving condition, and were clothed with heavy crops of wheat and other grain.

Norway is a pleasant village situated on a plain or intervale, and is remarkable for the neatness of its farms. The soil contains a little lime, which is evidently derived from the limestones which skirt the hill-sides around, alternating in strata with gneiss, and may be advantageously burned for lime, or for manure, since the soils will be improved by a more copious dressing.

In Paris I found the same kind of limestone exceedingly abundant and reposing upon the sides of the hills. It would be tedious to enumerate all the localities, since it is found in almost every part of the town.

We met, by appointment, Mr. E. L. Hamlin, who had kindly offered his services in showing us some of the most remarkable localities, discovered by him during his residence in Paris. By his aid we were enabled to make a more rapid examination of the beautiful simple minerals that abound upon Mount Mica, and have for many years been sought for by collectors and mineralogists.

These minerals are large plates or crystals of mica from 6 to 10 inches square, beryl of various shades of green, limpid and smoky quartz, black, green, blue and red tourmaline, rose quartz, felspar, garnets, &c. Specimens of all the minerals found at this place, were collected, and are now deposited in the State Cabinet.

We remained three days at Paris, collecting these rich and rare minerals, which operations having been placed under the superintendence of the Assistant Geologist, I was left at liberty to make further researches in the vicinity. Accompanied by Mr. Hamlin and a number of enterprising gentlemen of Paris, we made an excursion to Streaked mountain, for the purpose of examining its geology, and in order to measure the altitude of the mountain, by means of the barometer. On the 26th Aug. at Paris hill, on a level with the court-honse, the barometer stood 1 P. M. 29.418 T=69°. Ascending to the base of the mountain, we found, at Mr. Alonzo King's, 2¼ P. M., that the barometer stood at 29.150 T=69° On the summit of the mountain it stood 3 P. M. at 28.378 T=63°. Calculating the height of our second station from our first, we have 82.1 feet for its altitude above the first station. Then calculating from that point to the summit of Streaked mountain, we have 843.2 feet, which, added together, make 925.3 feet for the height of the mountain above Paris Hill. If now we calculate directly from the first station to the top of the mountain, we shall obtain 925.4 feet for its height, which differs from our former results but $\frac{1}{10}$ of a foot. By these operations we are enabled to prove the correctness of the measurements. Calculated from Portland harbor, and we find that Streaked mountain is 1756 feet above high-water mark, and Paris hill is 831 feet above the sea level. After making these measurements, I took the bearings of several points which may be seen from the mountain.

Pleasant Mountain in Denmark, North Peak bears S. 65° W. Southern Peak, S. 60°W. Central Peak, S. 64° W.

Kearsarge Mountain presents a sharp, well defined peak, which bears S. 82° W.

Speckled Mountain, a rough and barren mass of granite, near Peru, bears N. 60° W.

Paris church, N. 68° E.

Centre of Norway village, S. 77° W.

Hebron Peak, S. 30° E.

Singepole Hill, S. 54° W.

Norway Pond is 2°15 below the horizontal line from this mountain.

Streaked mountain is an important landmark for the country around, owing to its commanding situation. From its summit a most interesting panoramic view may be seen of the towns, lakes, and mountains around, and it has justly become a place of resort on account of its picturesque scenery. The mountain is composed of a coarse variety of granite, which has burst through the surrounding gneiss rocks that recline upon its sides, and form a large proportion of its mass. The granite appears in huge veins, which generally run E. N. E. and W. S. W. The gneiss alternates with granular limestone, suitable for agricultural purposes. The granite veins are rich in large and beautiful crystals of beryl, black tourmaline, and large plates of mica; common garnets also abound. Quartz crystals line cavities in the rock, but they are generally too small to be of interest to the mineralogist.

It will be observed by the geologist who may visit this mountain, that the strata of gneiss have evidently been forced up by a sudden and violent eruption of the granite; for not only are strata turned up and contorted, but fragments of gneiss have been torn off by the intruding rock, and are seen imbedded in its mass. The strata also recline upon the granite, through which passes the anticlinical axis of the strata. It is difficult where the rocks are so distorted to take the exact line of bearing, but we here estimate the direction of the gneiss to be S. 35° E. and N.35° W. When we had made our collections of specimens of the rocks and minerals we descended and returned to Paris, where we had left our assistantsat work, collecting the minerals of Mount Mica.

We visited the town of Greenwood, and near that town upon the estate of Dea. Porter, I obtained some specimens of bog iron ore. It does not occur there in sufficient quantity to supply a furnace.

There is a remarkable vein of plumbago, or graphite, near this place, included in a vein of granite, which intersects the gneiss, and runs E. N. E. and W. S. W. The plumbago is of fine quality, and suitable for drawing pencils, but it occurs in a very hard rock, and in comparatively small quantity. We obtained some specimens 3 inches long, by 2 inches thick, but they are difficult to procure. This mineral occurs in several other places around, and there may be some localities worth working, the mineral being of good quality.

It is a curious geological fact, that plumbago, generally believed to be of vegetable origin, should occur in such a situation as I have described. It may, however, have been derived from the stratified rocks of sedementary deposit, which may have been converted into gneiss. This question is not yet, however, fairly settled, and is open for discussion and more extended research.

The locality above referred to, is in the town of Greenwood. near its South Eastern corner, and occcurs on the hill almost overhanging the road.

Mica slate here rests upon gneiss, and is too much contorted for use as flagging-stones. It runs generally N. E. and S. W. and dips to the N. W. irregularly.

One mile South from Mr. Abiathar Tuell's house, we examined a locality, where black oxide of manganese is found in beds, just below the surface of the soil. It is about 16 inches deep, and is found in small heaps, separated from each other, and resting upon a fine white siliceous earth. The manganese is of good quality, and occurs in nodules, varying in size, from that of a pea, to an inch or more in diameter. These nodules are cemented together in solid masses, but are easily separated by pressure with the hand. It is evidently an alluvial deposit, and arises from the decomposition of the mangancsian mica-slate forming the hills around. Black oxide of manganese is used for various chemical purposes, and supplies us with chlorine for the manufacture of bleaching powder, or chloride of lime. It is also used for the preparation of oxigen gas, and for the destruction of vegetable matters in melted glass.

It is also employed in giving a rich amethystine color to paste ornaments in imitations of that gem, and for staining glass of the same purple hue ; and in pottery it is used both as a coloring matter and enamel. It is probable that larger quantities may be found, for we obtained nearly a peck measure of it in a few minutes. It is occasionally used for paint, and resembles burnt umber in color.

On the road to Washburn's Mills, limestone is found on the road side, in beds alternating with gneiss. A mineral spring occurs in Paris, which is resorted to by invalids on account of its tonic properties. It contains a little carbonate of Iron, and carbonate of manganese, the latter substance being deposited in the state of a fine red sediment. The water evidently extracts its mineral ingredients from the rocks through which it percolates.

Having obtained a full supply of the interesting minerals of this vicinity, we set out for Buckfield. In this town occur numerous veins and beds of granite. We examined those upon the estates of Mr. Waterman and Mr. Lowe. On the former estate, there are numerous narrow veins varying in width from one to six inches, and a vast number of detached angular blocks of granite occur penetrated by them. Large crystals of dark reddish brown garnet are also abundantly scattered through the granite, but it is yet uncertain whether any workable veins of iron ore occur on this farm, although we are of opinion that a considerable supply may be furnished from this locality, should iron works be put up in that vicinity.

On the Lowe farm, we examined an important bed of this ore, which was formerly opened, and being mistaken for a vein, was cut through and was supposed to have run out. This however, is not the case—but it is evident from our examinations, that it is a bed or sheet, dipping to the North East 25°. I measured its extent, and found that where it is visible, it extends to the width of forty-eight feet by thirty-six feet in length. Its average thickness is one foot, but in some places it measures nineteen inches. Allowing the bed to be but one foot thick, we have already exposed $48\times36=$

1728 cubic feet of ore, which will weigh almost 200 lbs to the cubic foot, and yielding 60 per cent of iron, will give 207,360 pounds of Iron within the limits measured. Since it may be easily wrought in a bloomery furnace, costing but a small amount, it is worthy of being manufactured. On opening this mine more extensively, should it be found to continue for a considerable distance, a blast furnace of a more extensive and costly kind might be erected. I would also remark that this ore is accompanied by an immense number of large garnets of a brown color exactly like those in the Sweden iron mines, which melted, with the ore, serve to render it more fusible. It may be easily mined, since it is naturally divided into irregular rhomboidal blocks, that can be turned up by the crow bar and pick. Charcoal, it is estimated, will cost $6 per 100 bushels, on the spot. Limestone suitable for a flux occurs abundantly in the vicinity. Should this mine be wrought, it will be advantageous, in case the blast furnace is employed, to add bog ore to the charge, since the ore is extremely heavy, and is liable to overload the furnace.

The little stream producing the cascade called basin falls, two miles west from the village, is a favorite place of resort for the inhabitants, on account of its picturesque beauty, and the grateful coolness of the air, under the shade of overhanging rocks and forest trees. This stream rushes over rough and craggy masses of gneiss and granite, and falls into a little clear basin of water, in a hollow of the rocks, and from this circumstance, the cascade receives its name. The gneiss is charged with pyrites, and by the action of the spray from the falls, its surface is kept moist, and a rapid decomposition takes place. The sulphur of the pyrites oxidizes, and becomes converted into sulphuric acid, and this acid attacks the felspar of the gneiss, appropriates to itself its alumina and potash, forming sulphate of alumina and potash or common alum. This substance encrusts the rocks in considerable quantities, above the falls, where they overlay the cascade. Sulphate of molybdena also occur in the gneiss in small scales. During our stay at Buckfield, we were kindly assisted in our labors by Mr. Parris

of that town, who devoted his time to our labors, and engaged actively in the work. I beg leave here to tender him our thanks.

Leaving Buckfield, we travelled toward Turner, examining the rocks, minerals, soils, and the elevation of the country as we proceeded. Near the Androscggin river, one mile South from the bridge, occurs an extensive bed of excellent potters clay, extremely fine and tenacious. It belongs to the fresh water tertiary deposit, is regularly stratified, and dipping gently to the N. N. E. It breaks naturally, as it dries into prismatic masses of a rhomboidal form. This clay is valuable for the manufacture of brown pottery, and its extent is such as to furnish a never failing supply.

On the road to Readfield, we examined near the corner of Winthrop, the direction ofthe gneiss, which runs N. E. and S. W. and dip N. W. 45°. Diluvial grooves may there be seen on the surface of the rocks in place, running nearly North and South across the edges of the strata, forming with them an angle of 70°.

Limestone occurs upon the estate of Mr. Isaac Bolls in Winthrop, and is similar to that found in Norway, and may be made useful in agriculture, as a top dressing. The strata alternate with gneiss, and run N. E, and S. W. and dip 80° N. W.

Proceeding through Winthrop, I had occasion to examine the mica slate-rocks, which run N. 47° E. and dipping N. W. 85°. Their surface is marked by obscure diluvial furrows, which run N. 5° E.

One mile North from the town, near the pond, good mica-slate is found suitable for flagging stones. It contains a few crystals of brown staurotide, scattered through its mass. On the road side, there are several slabs of this rock, which have been split out quite true, so that they will answer for side-walks.

On arriving at Augusta, we deposited our load of specimens, and visited the granite quarries of Hallowell. Limestone of good quality for agriculture has been lately discovered in this

town, on the estate of Mr. Levi Morgan, and on the road side. It runs across the country in a N. E. and S. W. direction, and is contained in strata of gniess. It may be advantageously burned for agricultural use.

HALLOWELL GRANITE QUARRIES.

Numerous quarries of granite-gneiss are wrought in this town, and large shipments of it are annually made to New York and other cities.

It is composed of white felspar, silvery-grey mica and a little quartz—the felspar being the predominating ingredient. Its color is greyish white, and when smooth-hammered, it appears at a distance like white marble. The mica is generally arranged in such a manner as to cause the stone to split easily into the forms desired, and it is very easily wrought by the quarrymen and sculptors.

Having made but a cursory examination of this stone, on a former occasion, I was desirous of making more extended enquiries, and was conducted to the quarries now wrought, by Mr. Otis of Hallowell, and Col. Redington of Augusta. The former gentleman is the director of the Hallowell Granite Company, and the latter owns extensive quarries which were in active operation when we visited them. Col. Redington's quarry occupies an area of about 6 acres, and the opening at present, is 154 feet square and presents an admirable view of the stone, which may be seen in regular sheets from 2 to 7 feet in thickness. Blocks of granite have been split off from the ledge, which contain 1200 cubic feet, and weighing more than 100 tons—and masses can be obtained of much larger dimensions. I measured one which can be detached or entire, that was 130 feet long by 4½ feet thick. The largest blocks that have been obtained for columns weighed from 16 to 18 tons, and were dressed and sent to New York.

A large contract has been made with Col. Redington for the supply of fine hammered stone, used in building the Hall of Justice in the city of New York, and some of the work executed on this granite is equal in beauty to any sculpture on mar-

ble. The architraves that were finishing at the quarry, are magnificent specimens of granite sculptured ornamental work in the Egyptian style. These stones are a little more than 15 feet long, 3 feet 11 inches wide, and 3 feet thick. On the front, are sculptured in relief, the symbols of the winged globe and serpents. This operation requires immense labor, since the face of the stone is cut away in order to present the figures in relief. The work is effected by Hallowell stone-cutters, men who have become adepts in the art. Each of the architraves cost no less than $317—$150 being expended in the sculpture. The window-caps of the same stone cost about $200 each when finished.

Ordinary ashler stones are furnished finely dressed for 25 or 28 cents, at Hallowell, and from 33 to 35 cents per superficial foot, in New York. The large blocks for columns sell for 90 cents per cubic foot on the wharf at Hallowell.

The expense of transporting the stone from the quarry, to the wharf, is 50 cents per ton, of 14 cubic feet, and shipment to New York costs $3 per ton.

This stone is certainly a very beautiful material for architecture, and admits of more ornamental work than the coarser kinds of granite and sienite, and the effects of light and shade are also seen to greater advantage. It is, however, more likely to become soiled when used in large cities for door-posts and basements.

The remarks which I have made respecting this locality, apply also to the quarries wrought by the Hallowell granite company, excepting that the dimensions of the stone obtained at their openings have not been so large.

It is, however, admirably wrought for ashler stones ; the opening, which is 500 by 400 feet in diameter, having been made in such a manner as to allow a great many different layers of the rock to be wrought at the same time, so that an immediate selection may be made of various dimensions required. There are no less than 26 different sheets of granite thus exposed, and the embankments, or steps of stone, are left in such a manner, that the quarry presents a perfect model of an an-

cient Roman amphitheatre. Indeed, so nearly does it resemble the ruins of one of those buildings at Verona, that a person standing in its arena would almost imagine himself amid the works of the ancient Romans.

The different sheets of stone measure from 8 inches to 4 feet in thickness, and the perpendicular depth of the quarry is about 20 feet. It is now ten years since quarrying was commenced here, and no less than $500,000 worth of granite has been sold. The capital stock of the company is $50,000, and is owned in Maine. No less than $13,400 clear profit was made at this quarry during the year 1836.

The land belonging to this company, at this place, is 175 acres, and about 20 acres of its area is composed of workable granite.

This statistical information was obtained from Mr. Otis, and is entitled to our fullest confidence. The immense value of these localities may be at once perceived on calculating the proceeds from the sales effected—the vast amount of labor employed, and the value of the carrying trade. It would require an essay upon political economy to trace the various beneficial results which flow from this species of industry, and it could be easily proved, that each and every citizen of the State possesses either a direct or an indirect interest in the wealth thus produced.

I examined also many other quarries in this vicinity, but since few of them are now wrought, it will be unnecessary for me to describe them here. Some of the stone contains a little iron pyrites, and since it shows a brown stain on its white surface, it should most sedulously be avoided. Indeed, every stone put into the front of an elegant building, ought to be most carefully inspected, in order to detect this troublesome mineral, and if it is found, the stone should be put aside, and used for some other part of the building, where it will not be seen. By such care, we shall avoid those discolored appearances, which mar the beauty of our public edifices.

It may be observed, that the surface of the granite, at the last mentioned quarry, presents, where it has been uncovered

of its soil, a polished water-worn surface, and on examination, distinct diluvial scratches may be observed upon it, running uniformly N. 10° W. It is interesting to observe these markings upon the surface of such a hard kind of rock, and to find that their direction coincides nearly with those formerly described. It will also be noticed by the geologist, that boulders and masses of mica-slate containing staurotide crystals occur abundantly in the soil, while that rock is not found there in place but does occur to the North West, in the town of Readfield. The diluvial soil resting upon the granite, at the quarry, varies in depth from 3 to 10 feet, and is made up of granite and mica-slate boulders.

It will be noticed, also, that the granite at the Hallowell quarries shows many long fissures or cracks, and these cracks have an uniform direction from N. 70° E. to S. 70° W. They were probably effected by an earthquake, and elevation, which broke the rocks asunder in the line of its direction. At what time this took place, we are unable to ascertain, but it was evidently since the consolidation of the rock. It is not improbable that lines of fracture throughout the granite, and other rocks in the State, may be found to coincide with the above mentioned direction, and we may yet be enabled to fix the epoch when it took place, by learning what rocks were broken by it, since we can demonstrate their relative age.

In Gardiner, there is a deposit of tertiary clay, filled with remains of marine shells. This deposit occurs near the house of Mr. Allen, forming a steep cliff, elevated 50 feet above the level of the river. Mrs. Allen has made a collection of the various fossils which occur buried there.

During the last spring, while giving a short course of lectures in this town, I had occasion to examine this locality, and obtained a great number of perfect shells, such as the sanguinolaria, mya, venus, mactra, saxicava, astarte castanea, balani and nucula. All these shells are of marine origin, and were evidently the inhabitants of the clay when it was covered with the waters of the sea. The whole mass is now 60 or 70 feet above its level, and has doubtless been elevated by subterranean power to its present situation.

This deposit belongs to two distinct epochs, called the pliocene and the newer pliocene.

It is remarkable, that the substance of the shells decomposes more rapidly than the animal matter, forming their epidermis, or outer skin; hence we find this matter remaining with a most perfect impression of the shell, while the calcareous substance has disappeared or is reduced to fine powder. The clay itself has the odor of marsh mud, and traces of the decomposed sea-weeds are easily detected, while the clay is black from the quantity of decomposed marine vegetable matter which it contains.

This tertiary deposit is identical with that of Bangor, and with that in Portland and Westbrook, which I shall presently notice. It probably extends along the banks of the river, from Augusta to Gardiner, and from thence to the mouth of the river, with interruptions here and there. It never attains an elevation of more than 100 feet above the sea-level.

The rocks in this place are principally gneiss, charged with so large a proportion of sulphuret of iron, as to decompose with great rapidity. On Iron Mine Hill, the strata run N. E. and S. W. and dip N. W. 70 or 80°. The rocks there may be seen crumbling into powder with great rapidity, so that the surface of the earth is covered with their detritus. The soil is in consequence, generally barren around, since sulphate of iron is destructive to vegetation.

By treating this soil with lime, it may be improved so as to become extremely fertile, for not only will the sulphate of iron be decomposed and rendered inert, but the lime combining with its sulphuric acid, will form an abundance of gypsum or plaster of Paris, a valuable manure.

On the right hand side of the road, going to Portland, in the town of Richmond, we again observed diluvial marks running in a N. and S. direction.

In Bowdoinham, granite rocks abound, and they include an abundance of rich and beautiful crystals of beryl and garnet.—The fine transparent sea-green crystals are found in a vein of greasy quartz, but it is now difficult to obtain good specimens,

since they have been mostly extracted by mineralogists and collectors. Being disappointed on a former visit to this place in 1827, I thought that when the rocks had decomposed, we might find the beryls in the soil, and by digging into the earth, Mr. Alger and myself, aided by a laborer, succeeded in obtaining in a few hours no less than two bushels of crystals. I have not yet had time to make any further explorations, but doubt not that there still are an abundance of beautiful specimens in this town:

Very large crystals of beryl have recently been found in the town of Albany, between Bethel and Waterford. I have not yet visited the place, but have seen a specimen of large size, which was sent to Professor Cleaveland, in Bowdoin College.

Brunswick and its vicinity have been most faithfully searched for minerals by Profr. Cleaveland and his pupils and a great variety of interesting specimens have been found. The rocks of that town are chiefly gneiss, cut through by an infinity of large veins of coarse granite containing large masses of felspar, admirably adapted for porcelain making. The general direction of these veins coincides with those formerly noted. The falls of the Androscoggin rush over rough, craggy masses, of these rocks. Specimens of this felspar have been wrought into beautiful mineral teeth by the Boston dentists, who prefer it to any other for their purposes, since it melts easily, and is free from oxide of iron. Fine poppy-red garnets abound in this rock near the falls, but they are seldom large and perfect enough for jewelry. Sulphuret and the oxide of molybdena occur below the bridge, close to the water's edge, and can be obtained only when the river is low.

A beautiful variety of green mica slate, filled with crystals of iron pyrites, was discovered in Brunswick, by Prof Cleaveland many years ago, and elegant specimens of it may be seen in almost every cabinet in the country. Large and valuable beds of pure crystalline white limestone, suitable either for marble or for lime, occur in the. S. E. part of B u iswick, near the coast on the estate of Mr. Jordan. The dimensions of these beds

were given in my Report for the past year, to which I beg to refer for their description.

TERTIARY FORMATION OF PORTLAND.

While digging the space for a cistern in King street, in Portland, a great number of marine shells were thrown out, some of which were preserved by Mr. Gordon, and submitted to my examination. They belong to the tertiary deposit, and are similar to those which I have formerly noticed, and are found 50 feet above the level of high-water mark. The shells are the nucula, mya, saxicava, &c. which are found in regular beds of clay, and were evidently in their natural positions, just where they had lived and died—the whole mass having been since elevated 50 feet above the sea.

SLIDE OF THE PRESUMPSCOT, WESTBROOK.

This locality is one of interest, on account of the vast number of fossil shells which are exposed to view on the surface of the clay, they being washed out abundantly by every fall of rain.

This slide is said to have taken place during the night in the month of May, 1831. The season is said to have been uncommonly wet, and the clay probably loosened by the frosts of winter, was rendered slippery, so that when its hold was broken it glided forward into the river. The waters of this stream were stopped in their course, and so dammed up as to overflow their banks and alter the channel to the South Eastward. This place is worthy the attention of the curious.

On examination, we find no less than 12 different winrows or long masses of clay, which have been precipitated forward, and the stumps of trees remaining, all point toward the river. One of the trees on the border of the stream, stands inclined at an angle of 40° from the perpendicular, and towards the stream. The space left by this slide, is 120 yards in diameter, and the clay-banks exposed, are elevated 30 feet from the river. The lower bed of clay was of a dark blue, and very tenacious and plastic, while the upper beds are more sandy, and of a light

grey color. Throughout the whole mass of the clay, we find an abundance of perfect marine shells frequently preserving the epidermis unaltered. Some of them are petrified, but more frequently they are unaltered. Among the shells obtained, are the following:—nucula portlandica, and new species of the same genus not yet described, two species of the mactra, mya dehiscens, saxicava, sanguinolaria, balani, and occasionally the remains of crabs and other crustacea. The various shells found at this slide are evidently of marine origin, and now we find them at an elevation of from 65 to 70 feet above the sea. It will be remarked that this elevation coincides nearly with the height of the tertiary deposits of Portland and Gardner, and with the lower tertiarv clay of Bangor.

At the brick-yard, near Pride's bridge, we found perfect casts of the natica and mytilus. This deposit is elevated about 60 feet above the sea, and belongs to the same formation as the clay at the Slide.

Before closing our remarks on the tertiary formation in Maine, let us observe, that the general height which these deposits attain, is about 70 or 80 feet, and since no such deposits occur at greater altitude than 100 feet, it is evident that the ancient tertiary sea covered the land only to that depth, and consequently a large portion of the State, now above its surface, must formerly have been submerged beneath the waters of the ocean, while the various prominences rising to a greater height than I have mentioned, must have stood like islands in the midst of the waves. A small portion of the land on which the cities of Portland and Bangor, are built, as well as a part of the land at Gardiner, Hallowell and Augusta, remained above the surface of the ancient ocean. These observations have not only a scientific interest, but a practical result, for the common brick-clays, being of this formation, generally lie below the altitude of 100 feet from the sea-level, and the higher land is destitute of such deposits. The plastic clay of Turner is of freshwater formation, and there occur also diluvial clays, but not abundantly. Hence in the elevated table lands of the State, we find that clay, suitable for brick, is comparatively rare.

The influence of the ancient sea, in the formation of soils, is not to be overlooked, for some of the richest calcareous marls are tertiary deposits. The water percolating through clay containing many marine shells, is always impregnated with carbonate of lime, and this occurs in such quantities in some wells of Portland and Bangor, as to become very sensible to the taste. It is deposited when the water is boiled, forming a crust within the tea-kettle.

In New Jersey there occur very extensive beds of marine shells belonging to the tertiary formation which are sought for as a manure for soils, and according to the report of the geological surveyor of that State, the quantity of this kind of marl varies according to the nature of the shells that it contains, some undergoing more rapid disintegration than others, so as to cause them to act more rapidly upon the soil. So far as our researches in Maine have extended, we find the shells too sparsely mingled with the clay to produce marl.

By calling public attention to this subject, I hope that many observing persons will engage in a search for deposits of sea-shells and marl, which if found, will add greatly to the agricultural interests of the State. Whoever remembers the formerly barren lands of New Jersey, now rendered fertile by this substance, discovered by her geologists, will appreciate the value of such a discovery. I would also beg leave to call the attention of citizens of Maine, to the recent marl formed by the decomposition of fresh water shells, on the shores of the lakes and rivers, for where many such shells are heaped up on the shores, they form marl.

In Pittsfield and Lenox, Massachusetts, marls evidently owe their origin to the decomposition of an infinity of fresh water shells, such as the planorbis, cyclas, and lymnea, and according to my analyses, they contain from 70 to 80 per cent. of carbonate of lime, besides a considerable quantity of vegetable matter.

Marls of a similar character occur on the shores of Millinocket lake, and may be seen at the carrying place between that and the Ambejegis lake, where the expansion of freezing water has turned up the muddy bottom.

ECONOMICAL GEOLOGY.

GRANITE.

This rock is essentially composed of the three minerals, quartz, felspar, and mica, crystalized or aggregated together, without any cement. Its good qualities as a building-stone, depend upon the regularity and admixture of these minerals, and upon the absence of those substances that deface or decompose the rock. It exhibits an infinite number of varieties of color and texture, while there are a few substances that have a chemical action upon it.

In some granites, the felspar is exceedingly hard, and breaks with an almost glassy fracture, presenting sharp and well defined edges, while it is translucent or transparent. This is the strongest kind of felspar, and it endures the action of the weather longer than the dull, earthy varieties. The mica contained in granite is of various colors, such as white, silvery-grey, green, red, or black; hence, from the intermixture of variable proportions of this mineral, we have the different shades of color. The quartz is an unalterable ingredient, and falls out when the other minerals have decomposed.

It will be generally observed, that black mica decomposes more rapidly than the lighter colors, while the bright white or silvery mica is slow in decomposition. The felspar, as it decomposes, first turns white, if pure, while if it contains prot-oxide of iron, it turns yellowish brown, and is gradually removed by rain and running water, and deposited on the lower lands in the state of clay. The quartz remains in sharp particles, or is worn by attrition into siliceous sand.

Sienite is composed of the same minerals as granite, excepting that it contains hornblende crystals instead of mica. The felspar of sienite is, however, more frequently impure, from the presence of prot-oxide of iron, and a little manganese;

these substances replacing an equivalent of one of its regular components.

When the quantity of oxide of iron is small, and in the state of per-oxide, the felspar is of a red color, and does not undergo any farther alteration from the action of the atmosphere.

When the oxide of iron exists in the state of prot-oxide, or at its lowest stage of oxidation, the felspar is of a green color, and will turn brown by the joint action of the air and water, owing to the per-oxidation of the iron, since we observe a deep brown crust upon the weathered surface of such rocks, known to quarrymen under the figurative name of the "sap," the term originating from an imagined analogy between this decomposed surface and the sap-wood of trees. This crust is apt to separate from the block of stone, and by the expansive action of freezing the water which infiltrates into the rock, the surface is gradually converted into gravel and soil. These remarks apply to the more highly ferruginous sienites. The stone from Quincy, Mass., contains a little prot-oxide of iron, and is observed to change color when kept constantly moist, but it preserves its freshness very well when exposed only to the atmosphere, being moistened but transiently. Thus we observe, that in but few instances, the buildings constructed of this stone become changed in color.

GRANITE QUARRIES.

Maine is pre-eminent for the abundance and excellent quality of her various and beautiful granite rocks, which offer facilities for quarrying and exportation, unequalled by those of any other part of the known world.

However public taste may vary in respect to the shades of color required for architecture, the quarries of Maine, furnishing every variety, will always be able to meet the demand.

Not among the least of the advantages over other states, are the facilities which exist for the ready transportation of the stone to market, since the numerous bays, deep inlets, and estuaries of large navigable rivers, afford ready access to most of the important quarries.

Owing to these uncommon advantages, the granite of Maine is destined to supply the whole Atlantic coast of our country, and the West Indies, for it can be quarried and shipped to any of our large cities at a lower price than any building-stone can be obtained in their vicinity.

It will be seen by the statistical observations in this report, that many of the Maine quarries can furnish regular dimension stones, of excellent granite, on board ship, for $1,12 per ton, and the expense of transportation to New York is rarely more than $2,50 per ton. Now there are but few cities where this article will not sell for at least $7 per ton, which will give a profit of $3,38 for each ton of granite.

Since this stone is so beautiful and substantial a material, it is certain that there will be a constantly increasing demand for it, as the population of the country increases, and new buildings are required.

I have not mentioned the high price which is paid for columns and other stones of large dimensions, but many such stones sell for 90 cents per cubic foot, and the increasing number of our public and monumental buildings, creates an extensive demand for such large masses.

I trust that we shall never again have occasion to see a public edifice, which ought to be a model of fine architecture, constructed of brick, and I doubt not, that the improving taste of our citizens will soon require more elegant materials for their dwellings than baked clay. Indeed, the effect of a blood-red brick city, is decidedly disagreeable to any person of taste, and is the first annoyance to which such persons are exposed on approaching our shores.

The rapidity with which a granite building may be constructed, is decidedly in favor of stone edifices, and I have no doubt that the materials may be furnished at nearly as low a price.

In this section I shall describe only those quarries which, from their situation, are available for commercial use. If I should undertake to describe minutely every locality in the State, where good granite is found, this report would be swelled into a large volume, for I have more than thirty dif-

ferent kinds before me, suitable for architecture, that were obtained in Maine, during the past summer, and there are many other localities, which not being available for commercial use, it was not thought worth while to represent.

The following quarries are all capable of being successfully wrought, and are situated near the sea-coast from whence they may be sent abroad.

On the Penobscot river there occur inexhaustible supplies of excellent granite rocks, admirably suited for architectural purposes, and so near navigable water as to render the stone valuable for exportation.

At the base of Mosquito mountain, beside a huge pile of rocks that have fallen from the mountain's side, and exposed a steep precipice of naked rock, the Frankfort Granite company have begun extensive operations for obtaining building stones. Thus far they have wrought only those detached blocks, that lie in confused heaps at the base of the mountain, by which much expense is saved in quarrying. Extensive buildings or sheds are erected to cover the workmen and their materials, and while engaged in dressing the stone.

This quarry was first wrought in the month of May, 1836; since that time more than $50,000 worth of granite has been sold. It has been mostly sent to New York, and is there used in constructing the Albany Exchange. That contract not yet being completed, the Frankfort Granite Company have not felt so severely as other quarrying associations the decline of business which has arrested so many other enterprises of the kind. There can be no doubt, if this quarry is properly managed, that it will become an immense and increasing source of revenue, both to the individuals immediately interested and to the State. A considerable sum, no less than $20,000, has been expended in digging a large sloop canal from the river to the base of the mountain, and that work must have consumed a considerable share of the proceeds from their sales, but when the work is complete, it will so favor the shipments as to make ample returns to the company. I am in hopes to obtain some statistical information respecting the operations at this quarry, and

shall then be able to give a more accurate account of its value.

The whole mass of Mosquito mountain is composed entirely of granite, and its height is 527 feet above high water mark, while the diameter of the mountain is at least twice the measure of its height, and it must contain at least five hundred millions of cubic feet, equal to 30,000,000 tons.

Mount Heagan appears to be composed of similar rocks.

Mt. Waldo is composed of the same kind of granite and is elevated 968 feet above high water mark. This mountain contains more than one billion five hundred millions cubic feet of granite, or one hundred millions of tons.

This stone is of excellent quality, is free from stains of oxide of iron, and does not contain any pyrites. It is an admirable stone for architecture, and will preserve its color unchanged. Its effect, when seen at a little distance, is much like that of the light colored granite of Hallowell. When examined minutely, the crystals of felspar become apparent, since, like the Mosquito mountain granite, it contains squares of felspar or is porphyritic in its structure.

Preparations were making for opening an extensive quarry upon the side of Mt. Waldo, at the time when we visited it, and I doubt not that the work will prove advantageous to the parties concerned. A road has been made so as to transport the stone directly to the river, where it can be put on board ship and sent to the cities where it is wanted.

I have seen specimens of the Mosquito Mountain granite finely dressed and polished. It is like that above described, and is vastly more beautiful than any of the oriental granites used by the ancient Romans.

Many other quarries have been opened in Frankfort, but few of them are wrought for the purpose of shipping abroad. I have described them so minutely in our topographical section that it will be unnecessary to recapitulate.

BLUEHILL.

Bluehill bay is a very convenient harbor for vessels engaged in transportation of granite, and there are immense and inex-

haustible quarries of this stone favorably situated for transportation. The New York Granite Company have opened extensive quarries about 1½ mile E. S. E. from the village, on the North East side of the narrows, and very near navigable water. The rock is coarse-grained, but when hammered, looks very handsome. Owing to the presence of black mica, it is a little darker than those before described. Columns weighing 35 tons have been split from this ledge, and others may be obtained which will weigh 84 tons. The mountain is elevated about 300 feet above the sea, and is about half a mile in extent E. S. E. and W. N. W. No less than six hundred millions of cubic feet of stone are contained in this hill within the limits of half a mile in length, by 1000 feet in width, and 300 feet in height.

The company own 250 acres of this mountain, and paid for it the sum of $5500. A railroad 70 rods in length costing $10 per rod has been made for the purpose of bringing the stone from the top of the hill, but it is entirely unnecessary, since it will be easier to quarry upon its side near the water, to which there is a regular and easy slope. Railroads so highly inclined as this, are very apt to get out of order, owing to the heavy loads carried upon them, and the wear and tear is so great that continual expenditures to a large amount are required to repair them.

This quarry, if well managed, must prove of great value, for the quantity of stone is inexhaustible, and transportation to market easy.

The Mc-Herd ledge at the head of Long's cove, has not been opened, but the stone seen there is a very fine kind of granite, splitting into any form desired and presenting a sharp and well defined edge. It is suitable for ornamental work and the most elegant devices may be carved upon it, which will present delicate sculpture to great advantage. I should recommend this stone for the capitals of columns and for window-caps upon which ornamental work should be carved. I do not know the extent of this granite, as much of it is evidently covered with soil, but there is amply sufficient for the purposes above designated.

There are many other localities where granite may be obtained on the shores of this bay, but few excepting those mentioned can be wrought profitably.

On the South Fox Island, Vinalhaven, good granite abounds, but has not been quarried. It is coarse-grained, but will answer well for large works. Granite also occurs upon Deer Isle, and may be used for the same purposes as that of the Fox Islands. For wharves, breakwaters, light-houses, monuments and other large or coarse structures, the large grained stone is as good as the finer and more costly varieties.

BUCKS HARBOR IN BROOKSVILLE, NEAR CASTINE.

The granite quarry opened at this place is one of great value, on account of the goodness of the stone, and the facilities for extracting and shipping it for sale. This locality is owned by a New York and New Jersey Company, and has been wrought by their agents to some extent, but owing to the pressure of the times, as I suppose, their operations were suspended at the time when I visited the quarry, and the place was under attachment by the quarrymen. About $1000 worth of rough and hammered stone lay neglected at the quarry. It is not probable, however, that property so valuable as this will be sacrificed for a small sum, and it will doubtless be again wrought.

This granite is rather coarse grained, but is handsome when dressed, and is free from any injurious admixture. Its felspar is of a pure white colour, and the mica is black. The latter mineral is generally the first that gives way to the action of the weather. The extent of the hill composed entirely of granite is 1320 feet in length, 1650 feet in width, and 300 feet in height. Its cubic contents will amount to more than 634,000,000 cubic feet, or nearly 40,000,000 tons. The cost of splitting and delivering the stone on board ship has not exceeded $1 12 per ton, and it may be furnished as low as $1 00 per ton. Cost of transportation to New York varies from $2 00 to $3 00 per ton.

Bucks Harbor is a deep and safe cove, protected by a little

island at its mouth. Castine Harbor, close at hand, is one of the best on our coast, and open at all seasons of the year.

Nearly the whole coast of Lincoln County is composed of granite and gneiss, the former rock predominating. This coast is remarkably indented, or rather gashed or serrated by deep bays, which extend far back, so that the various promontories stand out like giant fingers into the sea.

In many places the stone is suitable for architecture, and may be wrought, especially for heavy works, since it is very abundant and easy of access. In some of the localities which are described at length in our topographical section, there are valuable quarries of fine building stone, that have been wrought to some extent. It would require a volume to enter into detailed descriptions of every quarry, and this cannot be expected in an annual report.

The coast on the main land, and the islands around St. George, Friendship and Bremen, abound in granite rocks, many of which are of good quality.

That on Rackliff's Island is a beautiful building stone, and is free from pyrites and other injurious minerals. Its color is light, owing to the circumstance of the mica being of a grey color, and the felspar white. It contains but little quartz. Near Friendship, good granite is also quarried and sent abroad.

EDGECOMB.

In this town, a little below Wiscasset, and opposite Squam Island, occurs an extensive hill of dark colored granite gneiss, consisting of black mica, quartz and felspar; the former mineral predominating, gives it a dark blue colour. It is generally free from pyrites, and withstands very well the action of the weather. An extensive quarry has been opened there and contracts have been made and completed for the supply of stone, to New Orleans and other ports.

It is evident, from the extent of the hill composed of this rock, that there is an inexhaustible supply of beautiful building materials, which will be again extensively wrought, when business shall have returned to its usual prosperous condition.

I would observe that the Edgecomb granite-gneiss is here and there cut by coarser granite veins, and these should be avoided when the stone is supplied for buildings. There is enough stone of an uniform color, which can be furnished, and those blocks containing veins should be laid aside, and will find a ready sale. It is admirably adapted for window caps, steps to houses, and for elegant buildings. I should estimate the quantity of granite at this place at 1,500,000,000 cubic feet, or more than 100,000,000 tons. Hence, it will appear that there is amply sufficient for all future time; and it is situated very favorably for transportion and shipment, the slope being gradual to the river, and the water deep enough for any class of ships, while a new granite wharf affords an excellent opportunity of putting the stone directly on ship board, as the vessel lies at its side, the depth of water within 10 feet of it being not less than 12 feet, so that any vessel used for the purpose may come directly along side of the wharf, and take its cargo.

Phipsburg has a number of good quarries of granite gneiss, similar to that wrought at Hallowell. Pitch Pine Hill, Hunnewell's Point and Small Point Harbor are the localities which we have visited. Stone from some of these quarries has been sent to Havana, in the Island of Cuba, where it has been used for the purpose of making tesselated pavement floors for their warehouses, it being split into regular squares of 10 inches in width and 4 inches in thickness. There will doubtless be a new and increasing demand for similar stones, and there are abundant quarries here which can furnish any amount required. I doubt not that when the inhabitants of the West Indies have once learned the superior comfort of granite floors and stone buildings, that such materials will become an article of exchange with them, for their tropical produce.

In Brunswick, three miles from Bath, the New Meadows quarry is in active operation; an abundant supply of granite-gneiss is obtained, there being more than one hundred millions of cubic feet of this stone in one hill, which is elevated 85 feet above the sea-level. This stone is like that wrought in Hal-

lowell. For a more minute description of the locality, see our topographical section.

The Hallowell quarries are so well known that I need not enter into minute details of their value. I have already given a sufficiently full account of their extent and quality. The ridge composed of granite, in this town, is elevated about 400 feet above the level of the Kennebec, and it extends in a North East and South West direction. Since there are no well defined boundaries yet ascertained for this locality, it is improper to make an estimate of the quantity of stone that exists there; but we may say that, within the limits of 4000 feet in length and 1000 feet in width, that there are no less than 1,600,000,000 cubic feet, above the river's level, or more than 100,000,000 tons. This amount is, probably, not more than one half the actual quantity, but it must be remembered that, since the quarries are not on the immediate sea-coast, they will never be wrought to the lowest depths to which they can be drained. I merely give the above estimate, to show that the supply is amply sufficient for every demand that may occur.

There are also granite quarries in Augusta, which I have not yet explored, but which are said to be very extensive. The stone is exactly like the Hallowell granite gneiss, and is of good quality. It has the disadvantage, however, of not being so near navigable water, so that it cannot be shipped so easily as the Hallowell stone. It will, however, be used in the town, and I understand that quarrying operations are contemplated, for the purpose of sending it abroad.

Beautiful granite, of a light colour, splitting into any form desired, and perfectly free from impurities, occurs in the town of Waterford, but it is so remote from the sea, that it can only be used to supply the immediate vicinity.

KENNEBUNK.

Is also celebrated for its granite quarries, and large operations in this article are carried on at that place.

The principal opening is known by the name of the United

States quarry, and is extensively wrought by an enterprising company. The granite is of a dark color, owing to the predominance of black mica. Its felspar is of a pure white color, and is remarkable for its hardness, and almost glassy fracture. The quartz is in small proportion to the mass. It is the hardness of the felspar that gives this rock its peculiar tenacity, and prevents in a measure the action of the fine particles of pyrites, which it contains. Hence it does not show very perceptibly the brown marks which are apt to spot the granites containing this mineral. The dark color of the stone also serves to conceal such stains. There are numerous little crystals of sphene (an ore of titanium) scattered through the rock, but they do no harm, since they are more durable than its other ingredients, excepting the quartz.

I have given an account of the extent of the quarries opened, in another section of this report, and shall therefore only record here some statistical matter of interest, furnished through the kindness of John Neal, Esq. of Portland, one of the directors of the association.

"During the past season 12 men have been constantly employed at the quarry, and 10 are in Portland engaged in dressing the stone.

Rough split granite sells for $5 per ton of 14 cubic feet, on the Wharf at Kennebunkport. The price remains uniform up to the dimensions of 26 cubic feet, and above that measure, 2 cents per foot is charged for every additional foot.

Stones for store fronts hammered, sell for 75 cents per superficial foot.

Where two sides of a stone are fine dressed, and two rough hammered, three sides are charged, and nothing is demanded for the ends."

Where three sides are fine dressed, and one rough hammered, they charge for four sides and not for the ends.

Mr. Neal has promised to furnish me with a statistical return of the amount of their sales, for the present year, which I shall be happy to lay before you.

The granite obtained from the U. States quarry is mostly sold in New York.

There are many other ledges of similar granite in Kennebunk, some of which have been added to the property of the Kennebunk company, while others are owned by individuals, and by other corporations, but they have not yet begun to quarry the stone.

We may estimate the quantity of granite in this town to be 2 miles in length, by 1 in width, and 70 feet in depth, to the sea-level, which would give more than 3,500,000,000 cubic feet, or 250,000,000 tons. But it cannot be drained to more than half this depth, so that about half the above quantity is available.

The granite of the Ocean quarry, in Kennebunk, is exactly like that of the United States quarry.

That belonging to the New York and Kennebunk company differs by having light flesh colored felspar. It is colored by the per-oxide of iron, but will not undergo any change of color from the action of the atmosphere and water.

In Biddeford, there occurs a beautiful dark colored granite, of excellent quality, but not in sufficient quantity to supply large contracts.

Mr Libbey, Agent for the Sullivan Hopewell Granite Company has furnished me with the following statistical information respecting the quarry under his superintendence:

"The amount of stone quarried at the Sullivan Hopewell granite quarry, in the town of Sullivan, county of Hancock, on what is called Taunton bay, in 1837, 20 men being employed, was 17,783 feet, at 30c per foot, on the wharf. The facilities for getting the stone to the wharf are very good—the distance about 10 rods, a little descending. The expense of shipping to New York is from $2 to $3 per ton. There are about sixty acres, of which about one third is granite. Stone can be obtained of any dimensions required."

Sienite, a rock composed of felspar, hornblende and quartz, used also as a building-stone, under the common name of dark granite, occurs abundantly in Maine. Many high hills and mountains in York County are entirely composed of it, and if it should ever be required in the market, there is an abundant supply in the State.

The three mountains in York, called Agamenticus, are composed of sienite, the highest attaining an elevation of 672 feet above the level of the sea. The rock composing these hills is characterised by a brownish green felspar and hornblende. It is too remote from shipping to be profitably quarried for exportation.

An inferior kind of sienite occurs on the sea-coast, at Cape Neddock, but its felspar contains so much oxide of iron, that it has a dirty green color.

In Newfield there are huge mountains of this rock, of good quality, attaining an elevation of 1600 feet above the sea, but they are too remote from navigable waters to be available in commerce.

There are an infinite number of granite and sienite mountains in the interior of the State, that will furnish an abundance of building-stone, for use in their neighborhood, but which cannot be transported to the sea-coast, on account of the expense. I have, therefore, avoided taking up time in measuring their extent, or in describing them in this report.

Mica slate, valuable for flagging stones, and in great demand in our large cities for side-walks, is found abundantly in Maine. At Phipsburg, near Small Point Harbor, there are some beautiful and brilliantly spangled rocks of this kind, which would meet with a ready sale. They are not, however, so strong as the mica-slate brought from Bolton, Ct. owing to the predominance of granular quartz, but if made 6 inches thick, they will answer every purpose.

In Winthrop, Acton and Lebanon, good mica-slates are found, but they are so remote from the sea, that I do not know as they can be profitably quarried.

Slabs of good dimensions, and perfectly true, 4 inches in thickness, from the Bolton quarry, I am told, sell for 50 cents per superficial foot. If this price can be obtained for the mica slate rocks of Maine, it may be worth while to quarry them so as to supply the market.

Those which have been obtained at Phipsburg, measure 5 feet by 15, and are about 4 inches thick. I do not know

whether any of them have been offered for sale. If such mica slate, as occurs in Acton, can be found near water communication, it will be of great value.

LIMESTONES AND MARBLES.

No other State can vie with Maine in the abundance of its limestones, and the amount of revenue derived from commerce in this article is immense, and probably far greater than is generally apprehended.

Thomaston is justly celebrated for her inexhaustible quarries, which serve to supply nearly all the cities on the Atlantic coast with the lime used in their buildings, and for agriculture.

Few, perhaps, realize the fact, that there are no less than 14 million dollars worth of limestone within 20 feet of the surface, in Thomaston; and that already, while but a trifling proportion of the stone is exported, nearly half a million of dollars are annually realized from the sales of lime; beside which, we have also to estimate the value of the carrying trade, the whole business being in the hands of the citizens of Maine.

Limestone abounds also in Camden, Hope, Lincolnville, Warren, Union, Whitefield, Machias, and Lubec, from several of which places it is exported in the state of lime.

The present season has added many new localities to our list, and they will be found fortunately situated, just where a new and important demand was springing up, owing to the discoveries made respecting the treatment of soils.

York, Cumberland, Oxford and Kennebec Counties contain as much lime as will be required for their agriculture.

I have, in several places in the interior, ascertained that the price paid for Thomaston lime, was as high as $4 per cask, which high cost precludes its use upon the soil.

On the Aroostook, the people pay $16 a tierce for St. John lime, while the very rocks under their feet are composed of excellent limestone, and wood costs only the labor of cutting. They are, however, unacquainted with the nature of the rock, from which this substance is made, and know nothing of the simple art of lime-burning. They will, however, soon

learn, and will hereafter value the rocks around them, which were formerly unheeded, or considered useless.

There are many districts in Maine, where the comfort of a well plastered wall is unknown, yet limestone-rocks occur all around, and the untamed forest offers an abundance of fuel.

Although we have discovered many new and important deposits of limestone in the State, I am still of opinion, that every year the demand for the Thomaston lime will be on the increase, for the farmers in various parts of our country are now awakened to the value of this mineral, as a manure for the amendment of soils.

Many valuable beds of limestone occur in the interior of the State, where the expense of transportation forbids the use of Thomaston lime for agricultural purposes. By means of wood and peat, abundant in the vicinity, this limestone may soon be made to double the produce of the soil. For it may be readily burned in large quantities in temporary kilns erected for the purpose, and the lime ashes being mixed will form a most valuable article for fertilizing the soil.

The limestone found in York and Oxford Counties, is included in alternating strata of gneiss, or mica-slate, and the width of the beds varies from a few inches to several feet in thickness. These beds generally rest upon the flanks of granite mountains, and they occur also on the hills and table-lands.

In many of the towns through which we passed, the stone walls were principally built of this rock, and an abundance of it is scattered over the fields. This limestone is of the very best kind for agriculture, since it is destitute of magnesia, and may therefore be used more freely, and with less scientific knowledge on the part of the farmer.

When pure lime is wanted for mortar, the best stone may be selected for burning, or the rock with its foreign minerals can then be taken from the kiln after being burnt; slaked with a little water, the lime being riddled out very easily, while the refuse will prove valuable as a manure, for it will have much lime adhering to it. In this case, the sifted hydrate of lime is to be immediately mixed with the sand by means of more water, if it is required for mortar.

The limestones which we have collected were obtained in the following places.

Newfield, Norway, Paris, Buckfield, Winthrop, Hallowell, Whitefield, Brunswick, Phipsburg, Union, Bluehill.

The six first mentioned localities furnish granular limestone, imbedded in gneiss, suitable for agriculture.

The Whitefield locality I have not yet examined, but the specimens given me are the stratified blue and white compact carbonate of lime, of good quality.

The Phipsburg limestone is highly granular or crystalline, and is colored here and there by plumbago or graphite. This rock is very pure, and suitable for every usual purpose.

Union possesses a very inexhaustible supply of elegant white dolomite marble, suitable for lime and for monumental architecture.

ROOFING SLATE.

Bangor, in Wales, has hitherto enjoyed the exclusive privilege of supplying the world with roofing-slates, but it is certain that she will find a powerful rival in the Bangor of Maine, for that city is destined to be the place of exportation for all the good slates used on the Atlantic coast.

Inexhaustible quarries of this valuable material occur along the banks of the Piscataquis, from Williamsburg to Foxcroft, and it is highly probable that we do not yet know a tenth part of its extent. We do know, however, that there is a sufficiency there, to supply the cities of America, if not of the whole world.

In Williamsburg, Barnard and Foxcroft openings have been made, and the quality of the slates has been proved to be equal if not superior to any ever used in roofing. Every foot of rock gives from 30 to 40 handsome slates, and some have been obtained and made into writing slates, large enough to calculate upon the extent and value of the quarries, for they may be obtained 9 feet by 5 square. One which I have seen framed was 2½ feet by 4 feet, and was very handsome and of good quality as might be desired.

There have been obtained during the present season about 100 boxes of roof-slate, which was quarried for the purpose of testing its value.

When a road is made, and the means of transportation are prepared, we shall see an abundance of this article in the market, and people will not care which Bangor it comes from, so long as it is of good quality, and is sold at a low price. Even in the present state of the country, I understand that the cost of furnishing the Barnard and Williamsburg slates to market is not more than $5 per ton, in Bangor, and $11 per ton in Boston. Thus:

Cost of quarrying and trimming, ...	$3
Transportation to Bangor, ...	5
Do. from Bangor to Boston, . . .	3
	$11

The Welsh slates, I am informed, sell for $27 per ton, so that even were the cost double the amount above estimated, there would still be a large profit to the owners of the quarry.

We observed that most of the houses in Bangor, and other cities of the State, are covered with Welsh slates, that were first imported into New York or Boston, and there purchased and transported to Maine.

A few years hence this will appear equally absurd with the fact, that our fathers used to send to Wales for grave-stones, and the good Dutchmen of New York to Holland for brick. Indeed, we need not go so far from home, for less than 20 years ago, I am told, that it was customary to send from Hallowell to Quincy for granite or sienite, to make underpinnings to the houses in that town, and to this day Quincy supplies Maine with tombstones!

So it has been and must be with every State, until their hills and mountains are explored, so as to develope their resources, which might otherwise pass unheeded for ages.

In Thomaston it has always been customary to burn limestone with a wood fire, and formerly an immense quantity of this fuel was used, since it then required no less than thr

weeks to burn a kiln of lime. It was afterwards found by trial, that the operation could be as well performed in the space of four days and nights. The stages are divided into four "turns," or watches, and the consumption of fuel for each turn of 24 hours is as follows:

On the first day, or turn,		2	cords	of wood	are burnt.
" second	"	3	"	"	"
" third	"	3	"	"	"
" fourth	"	2	"	"	"
		10	"		

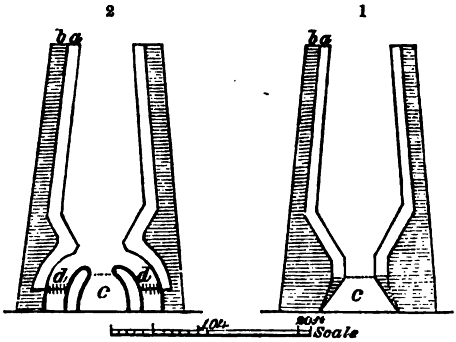
This amount of fuel is required for every 100 casks of lime, and an ordinary kiln contains 300 casks, so that about 30 cords of wood are consumed in burning each kiln. It is a curious fact, that although as much wood is crowded in as will burn, that the quantity consumed should vary in the manner above stated; but it is well known by the lime-burners, and I was assured of its truth by Dr. Cochran and other observing gentlemen in Thomaston. In order to expel the carbonic acid from limestone, it is only necessary to bring the rock to a uniform red heat, and if this is effected, the lime may as well be made in half an hour, as in four days, but it is difficult to heat the pieces of stone suddenly, without fusing their surface so as to destroy the lime. Hence the operation requires a slower and more regular application of heat than might at first be supposed.

On account of the present high cost of wood, it was proposed to make trials of other and cheaper methods of burning lime, and it has been found, that refuse skreenings, or dust of anthracite, will answer the purpose.

There have been two perpetual kilns erected in Thomaston during the past summer, and I was informed that the price paid for coal dust in New York is $1,75 per ton, and that it costs from 50 to 75 cents per ton to transport it to Thomaston. One ton of coal, it is estimated, will burn from 25 to 30 casks of lime, so that while that burned by means of wood costs 24 cents per cask, for burning, the coal kilns will furnish the same quantity for the cost of from 8 to 15 cents. Owing to

this discovery, a complete revolution will be effected in this business, and when lime is furnished at a lower rate, there will be a proportionable augmentation in the demand. Every farmer who needs it, and who formerly could not afford to lime his soil, will now be enabled to obtain a supply at a low price.

It may be useful to present a sketch, showing the principles on which the perpetual kiln is constructed, and the wood-cut below represents a section of one of them. No. 1, is a perpendicular section of the coal kiln, used in Thomaston. The attached scale gives its proportions.



a Lining of fire stone, (talcose slate.)
b Common rock, (mica-slate, or argillaceous slate.)
c Drawing arch from which the lime is taken, as fast as it is burned, the bars of iron represented by the dotted line being removed, so that it falls upon the hearth, and is removed and packed when cool.

Lime may be burned also by means of peat and wood, in a large oblong square kiln, the stone being piled up in alternating layers, with this fuel which is to be fired from the arch below. This processs is particularly adapted to the burning of lime for agricultural purposes, and temporary kilns of large dimensions may be made for the purpose. In this case, it is intended, that the whole mass of lime and ashes mixed, should be used together, as the mixture will act favorably, especially in the treatment of sandy soils.

The dimensions of this kiln are 22 feet in height, 9 feet across the *boshes*, (the widest part internally,) 6½ ft at top, and

the hearth is 2 ft wide. A shed is erected immediately before the drawing arch, so as to cover the workmen and protect the casks of lime from rain. Two kilns are kept in operation, and are covered by a common shed. The charge of limestone and coal is introduced from the cliff, against which the kilns are built, and they are kept always full, more charge being added as the lime is drawn.

Fig. 2, represents a section of a new kind of kiln, in which, either anthracite dust, bituminous coal or wood may be used, or both may be employed at the same time.

It differs from the other perpetual kiln only, by having arches in which the fuel used is to be wood or bituminous coal. The arches should be of larger dimensions in proportion than are represented in the plan.

This kiln is easily constructed, and may be made to serve in various ways, as the price of each kind of fuel changes. In case coal dust is used, no fire is required in the lateral arches, but they should be stopped by means of a stone.

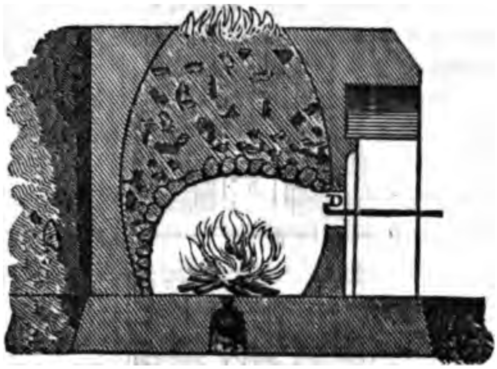
It is obvious that the fire is here under the absolute control of the person who tends the kiln, for the opening being closed below, the rapidity of the combustion can be checked at pleasure, and by opening the hearth door the draft may be renewed. Since the fire is never extinguished unless to make repairs, a vast amount of heat is saved, which in others is required to raise the heat of the kiln, and no time is lost in waiting for it to cool, so that it can be discharged. Since the heat is uniform, there is not so much injury sustained in the stone-work, by cracking from expansion and contraction.

In the country, where coal cannot be obtained, we recommend the new kiln, since it requires but very little wood, and the operation may be carried on steadily, while all the ashes is kept apart pure and suitable for the manufacture of potash. In this case, the limestone is not heated to full redness until it reaches the centre of the boshes, and it is there burned by the concentrated flames from the arches *d d*, from whence it descends to the hearth, converted into lime.

The following wood cut represents the form of the common

lime kilns used in France, in which the lime is burned by means of fagots of wood in twelve hours.

FIG. 3.



A. Lime-stone laid in the form of an arch upon which the smaller fragments are piled.

D. Fire arch into which the fuel is thrown.

C. and V. Ash-pit and draft-arch through which the air passes to support combustion.

Figure 4 represents the new French lime-kiln in which Peat is used for fuel and it may be advantageously employed in Maine where that substance is abundant.

Its proportions are 16 feet in height, 8 feet in diameter at its widest part internally.

The upper view represents a vertical section of the kiln set for burning, while the lower one is a ground plan of the hearth in the tranverse section at M. M.

L. L. F. F. represent the lining of fire-brick or fire-proof stone.

M. M. the outer layers of stone masonry.

G. shews the proportional lines of the curvature.

K. the Chimney.

E. E. C. the grate.

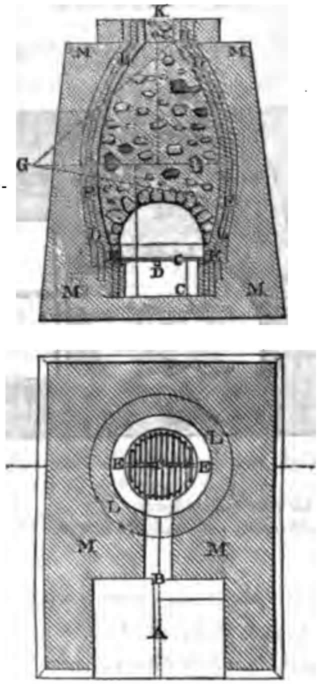
D. the ash-pit.

In the ground plan.

A. B. the arch where the fire is managed.

L. L. ground plan of the lining near the grate.

Fig. 4.



By means of their eliptical forms, the French kilns save a considerable proportion of the heat, since it is radiated by the walls into the midst of the limestone instead of being immediately lost by the mouth of the kiln.

I have considered it an essential requisite for granite quarries, that they should be situated near the sea-coast, but with regard to limestone intended for home consumption, it is decidedly advantageous to find it in the interior, where fuel is cheap and abundant.

Thomaston, Camden, Lincolnville, and Union will supply the market abroad, while it would prove too expensive for the farmer residing 50 or 100 miles from the sea-coast, to transport the lime from those regions, to his farm. Hence he will depend upon the localities discovered in his vicinity.

SERPENTINE.

On Deer Isle occurs an enormous mass of serpentine, which has been thrown up through the granite. This substance is composed of silex, magnesia, lime, oxide of iron and water. It is filled with delicate fibres of asbestus, which have become indurated, and will give an admirable effect to the polished stone. It also contains scattered lamellae of diallage, that gives it a variety of different shades.

This rock is identical with the highly prized marble, known under the name of verd-antique. It is of a deep olive green color, with many lines of asbestus and spots of yellow diallage.

In quarrying the serpentine, it will be necessary either to mortice it out, or to blast it in huge masses, by means of gunpowder, large and very deep holes being drilled for the purpose, so that the blocks may not be shivered by the discharge. Small ornamental articles have already been made from the quarry, but no extensive operations have yet been carried on. If it can be obtained in good sized slabs, it will become an important article of commerce. The locality has already been described in our topographical section.

If the price of epsom salts and magnesia would warrant the operation, these substances could readily be made from this serpentine, since 100 lbs of the rock, will, when combined with sulphuric acid and crystalized, produce 198 lbs of epsom salts, which decomposed by carbonate of potash or soda, will give carbonate of magnesia, and by the chemical operation a large quantity of Venitian red may also be produced. Works of this character are carried on near Baltimore, and they are for the present, able to supply the demands of the market.

Hone slate, or novaculite, useful for oilstones, is extremely abundant in Maine, and may be advantageously wrought upon Little Deer Island and the Western Island in Penobscot bay. It is equal in quality with that brought from the Mediterranean, known under the name of Turkey oilstone, which sells in Boston for fifty cents a pound. If this rock is extracted

and shaped as required, for sale, it will meet with a ready demand, and the locality is amply sufficient in extent, to supply the world with oilstones.

Felspar, suitable for the manufacture of fine porcelain or china ware, is abundant in Maine, and is vastly more pure than the kind used at the porcelain works of Sevres in France. When citizens of Maine have become adepts in the art, we need not send abroad for China ware, for we have all the materials required and an abundance of soft wood necessary for baking the ware.

I have had the properties of the felspars of Maine amply tested by three years experience, and dentists to whom I have given specimens, pronounce that from Brunswick the best they have ever used in making mineral teeth, which are formed from this mineral.

Plastic clay, suitable for brown ware, is found abundantly in Maine, and that upon the Androscoggin in Turner, is the finest I have seen, and might be extensively used for this kind of pottery. From it milk pans, jars, and various other articles of domestic and dairy use may be manufactured. An extensive deposit of this fresh water clay occurs in the town of Madewaska, on the banks of the St. John.

Fuller's earth is found in Newfield and Parsonsfield, and in the former town was once an article of trade, but the demand has since declined, owing to improved processes in cleansing cloth, so that it is now but little used in factories. It will, however, be useful for domestic purposes in removing grease spots, for which purpose a small demand will always exist.

Jasper, a precious stone, is also found abundantly in the State, in beds always in contact with trap rocks. On Sugar Loaf Mountain, upon the Eastern bank of the Seboois river, there is a bed of this mineral, 10 feet wide, cuttıng through the mountain, in contact with a huge trap-dyke to which it owes its origin. Immense quantities of boulders, or rounded masses of jasper, also occur scattered in diluvial soil, and are also found in the bed of the Aroostook and St. John Rivers.

Chalcedony and carnelian are also found in globes, or hollow

sperical masses in the amygdaloidal trap rocks, and also as boulders, in the St. John river.

Horn-stone, which will answer for flints, occurs in various parts of the State, where trap-rocks have acted upon silicious slate. The largest mass of this stone known in the world is Mount Kineo, upon the Moosehead lake, which appears to be entirely composed of it, and rises 700 feet above the lake level. This variety of horn-stone I have seen in every part of New England in the form of Indian arrow-heads, hatchets, chisels, &c. which were probably obtained from this mountain by the aboriginal inhabitants of the country. It breaks with a sharp cutting edge, and appears well adapted to the uses for which it was employed.

Fluor-spar, a mineral composed of fluorine and calcium, is found in Maine at Long Island in Bluehill bay. It is of a green color and is crystalized in octaedra, a form composed by two four sided pyramids applied base to base. This mineral is used only by chemists, for the preparation of fluoric acid, and by the workers in glass for etching on that substance. When it is pulverised, and put into leaden or silver vessels and then treated with sulphuric acid, and warmed fluoric acid gas rises and will dissolve the silica in the glass, removing it in the state of fluo-silicic acid gas; and if the surface of the glass is covered with a layer of wax, and figures are drawn through the coating, with a pin or needle, and the glass is then exposed to the fluoric acid gas, designs may be engraved upon that substance in a few moments. Fluor-spar is sold in the apothecaries' shops for fifty cents a pound, but the demand at present, is very limited.

Phosphate of lime occurs in scattered crystals in granite-rocks in almost every part of the State, and may be known by its brilliant green color, and its phosphorence or light which it gives out, when thrown on heated iron. Some varieties of it, however, are clear and colorless, and others are straw yellow; hence its appearance being very deceptive, one of its names, *apatite*, is derived from the Greek word signifying to deceive. Another fine bluish green variety is called from its color, asparagus stone. Its colors arise from certain accidental color-

ing matters which it contains. This mineral is not an article of commerce.

Beryl, a sub-species of the emerald, occurs in Maine, in large and beautiful crystals, some of which are from 6 to 8 inches in diameter. It crystalizes in the form of a 6 sided prism, with plane terminations. Its color is of various shades of green, and the nearly transparent varieties of a sea-green color are used in jewelry, under the name of aqua-marine; the latter variety is found in Bowdoinham, imbedded in quartz veins, which traverse granite. The other dark grass-green varieties are also found there in the granite itself, and in the soil derived from its decomposition.

Large and beautiful beryls are also found in the granite of Parker's Island, at the mouth of the Kennebec river. [See specimen in the cabinet.] They are also found in Albany, near the Portland road.

This mineral is not used in commerce, excepting when of a rich and deep green color, and it is then known under the name of emerald—its color being produced by a trifling quantity of chromic acid.

Garnets suitable for ornament occur in various parts of the State, the finest yellow kind being found at Phipsburg, while the deep red occur at Brunswick.

The various colored tourmalines are found in Paris, Oxford County, and were first discovered by E. L. Hamlin, Esq. while a resident in that town. They are the following :

Green tourmaline, of a rich pistachio, olive, and emerald green color, frequently transparent, and equalling the emerald in beauty. Specimens of this stone have been cut and used for ornamental purposes.

IRON ORES.

There are an abundance of valuable ores of iron in Maine, which are of great statistical importance to the country. Iron is one of the essential requisites in all the arts of civilized society, and is the strong arm of national prosperity. It is a knowledge of the art of working this metal that distinguishes the more

powerful civilized races of mankind, and gives them the means of withstanding the encroachments of barbarians.

It will be impossible for me to enter minutely into details re-respecting the usefulness of this substance, and I have only to refer to the various instruments used in the arts, to satisfy you of its paramount value. It will be seen that iron is the metal that gives us the power of subduing nature to our will. It forms the plough that tills our fields, and the sword, spear and gun which defend them. On the one hand it is employed as culinary utensils, in which our food is prepared, and on the other it is made to hurl cannon balls at our foes. From the plough to the penknife it is the most universal metal employed in the arts of life. Its magnetic properties directed Columbus across the ocean and discovered this continent; the same property serves now to direct our course through the midst of pathless seas and tangled forests, while it also serves to point out the boundaries of our landed estates. I need say no more of uses so apparent to every observing man, but I will remark that this metal, in a statistical point of view, is worth ten times as much as all the so called precious metals that are wrought in the world. That is the real amount of actual value received from iron mines is ten times as much as is obtained from those of gold and silver and is just half of the whole value of the metals known and wrought in the world. Several mines of this ore were described in my last report as occurring in Maine, and I have great satisfaction in stating that we have discovered several new and important veins and beds of this valuable mineral situated where they can be wrought advantageously.

On the Aroostook river, near the house of Mr. Currier, I found a bed of Red Haematite Iron, ore of the very best quality, 36 feet wide and of immense and unknown length.

This ore is included in Calciferous and Manganesian Slates and is admirably situated for mining and for transporting to market. Endless forests occur around, that will supply an abundance of charcoal, which requires only the labor of preparing. Stones suitable for building the furnace occur immediately above on the River, a few miles distant. Limestone

abounds in the immediate vicinity and red sandstone that may be used for hearth stones, occurs upon the Tobique stream in New Brunswick.

This ore contains 53 per cent. of Iron and will give 60 per cent. of cast metal or 50 per cent. of bar Iron. The ore is wholly inexhaustible, since it runs with the strata of slate, probably through the wilderness towards Houlton. It is cut off in one place on the Presq Isle river by a dyke of trap, but will doubtless be found again beyond it, running on in the same line.

Since the last Report was presented, I have made a chemical analysis of the Woodstock, N. B. Haematite, which, like that above described, contains 53 per cent. of Iron. We have not yet been able to examine that bed so as to trace it across our boundary line, but there is no doubt of its existence within our jurisdiction.

At Linnaeus, Mr. Carey of Houlton, has discovered several valuable beds of Granular Magnetic Iron ore, accompanied by Manganesian slates. It has doubtless been acted upon by trap-rock which has reduced it from the Per. Oxide or Haematite to Magnetic Iron ore. In Buckfield there are found excellent ores of Iron, exactly like those of Sweden, from which their fine tough Iron is made, so universally admired for its strength, purity and adaptation to the making of cast steel.

Newfield and Shapleigh abound in Bog Iron ores, yielding from 30 to 40 per cent. of good cast Iron.

Argyle and Clinton have also extensive deposits of Bog Iron. Magnetic Iron ores have also been found in Patricktown and in Raymond, but I have not been able yet to explore their extent and value.

It is probable that many of these localities may be advantageously wrought by means of charcoal. Where a deposit is very extensive a blast furnace may be erected. If, however, there are doubts as to the extent of the ore, then Bloomery forges of trifling cost should be used and bar Iron may then be made.

A small blast furnace capable of smelting one ton and a half

of iron per diem, will cost about 11,000 or $12,000.—Large establishments require a capital from 50 to $100,000.

Bloomery forges are like those used by blacksmiths, excepting that they have a deep fire-proof bed, and are of much larger dimensions. The cost of a bloomery, with its building (a mere wooden shed) would not amount to more than from 800 to 1000 dollars. Two trip hammers are required, and water power for moving them, and for blowing the furnace. No one should attempt to put up a blast furnace without the aid of a practical furnace-man, since there are many details in the art, which can only be learned by experience.

In the town of Buckfield in Oxford county, there are several beds of rich magnetic Iron ore, included in granite rocks. On Waterman's farm, it occurs in veins from one to eight inches wide, and they are so abundant that a considerable supply may be obtained. I should think, that even among the loose masses at present lying upon the soil, a man could collect nearly a ton of ore *per diem*. This locality is worthy of more extensive exploration, since it is probable that wider veins may be discovered and will prove a valuable addition to that which can be extracted from the mine on the Lowe estate, where there is a bed of excellent magnetic iron ore, capable of yielding an ample supply for bloomery forges, from which the very best kind of wrought iron and steel may be made. This locality is worthy the attention of iron founders, since the ore will yield about 70 per cent. of cast iron, and 60 per cent. of bar metal.

In the town of Shapleigh, there is an extensive bed of excellent iron ore, running along the borders of Newfield upon the Little Ossipee river; and there, a small but good blast furnace has been erected by a Portsmouth Company, and from 1 to 1½ tons of iron are manufactured daily, while the furnace is in blast. This ore yields about 40 per cent. of metal which is of good quality, and capable of being converted into bar iron and steel. I have had an opportunity of collecting some statistical information respecting these works, which is here presented.

The furnace belongs to a corporation called the Shapleigh Iron Company. It is situated upon the banks of the Little Ossipee river in Newfield, and was erected last year, under the superintendance of the experienced iron master, Thomas O. Bates, Esq. of Bridgewater, Mass. The cost of the furnace and buildings was $13,000 when completed. It is lined with English fire-brick, and the hearth is of Talcose slate from Smithfield, R. I. It was put in blast for the first time, on the 14th of January last, and by some accident the charge became chilled, so that the operations were arrested until the present year; when on the 9th of August, it was again put in order and set at work, one thousand tons of the ore having, in the mean time, been collected. About 800 tons were on hand at the time when I visited the works. The charge for smelting is as follows:

4 boxes of bog ore,
10 bushels of charcoal, or 5 baskets.

Eight bushels of clam shells are used per diem as a flux. There are 20 charges as above. The quantity of iron obtained from it *per diem* is 2,400 lbs. and the castings are made twice a day, the metal being drawn into pig iron.

At the time when I visited the works, the furnace had not attained its full blast, and but 2,400 pounds of ore were smelted, which gave half a ton of pig iron daily. Charcoal made from hard wood costs 6 cents per bushel, but it is supposed that it may be obtained for a less price, when people in the vicinity have become accustomed to preparing it.

I have lately received from Messrs. Samuel Huse & Co. who are proprietors concerned in this furnace, the following statistical facts.

NEWBURYPORT, Dec. 20, 1837.

SIR—As we have now had more time to ascertain the qualities of the bed of ore, we have been engaged in working at Shapleigh, in the county of York, State of Maine, we will endeavor to give you as nearly a correct account of our results, as is practicable at this date. We will merely say that, in con-

sequence of the ore working somewhat differently from the ores that have been found in Massachusetts, we have had some difficulties to encounter, which have prevented our complying with your request at an earlier period, and perhaps will not be sufficiently correct, in all the statements we shall make, for you to give as a correct data for others to build upon—but we give you the rate of the working of the furnace for the last thirty days, and you can draw your own conclusions.

The average amount of ore has been about one hundred and twenty boxes for 24 hours—weight per box 60 lbs.—7200 lbs. Coal 120 baskets, equal to 260 bushels. Nett amount of iron from the above ore, one and a half tons per day, or in thirty days 45 tons.

The quality of the ore is considered as good as any in the New England States, and much resembles that found in the State of New Jersey. This furnace is not of the largest class, as we did not think, at the time we erected this, the quantity of ore in our vicinity sufficiently large to justify one of that description. We have since discovered traces of more ore, which will increase the quantity sufficiently for this, and perhaps another furnace, for some years—but not so extensive a bed as may be found in some other parts of the United States. Any further information you may wish, we shall be pleased to communicate. The furnace is now out of blast, after making a blast of seventeen weeks, and will probably remain so for about sixty days, as the season is rather unfavorable for the commencement of new operations.

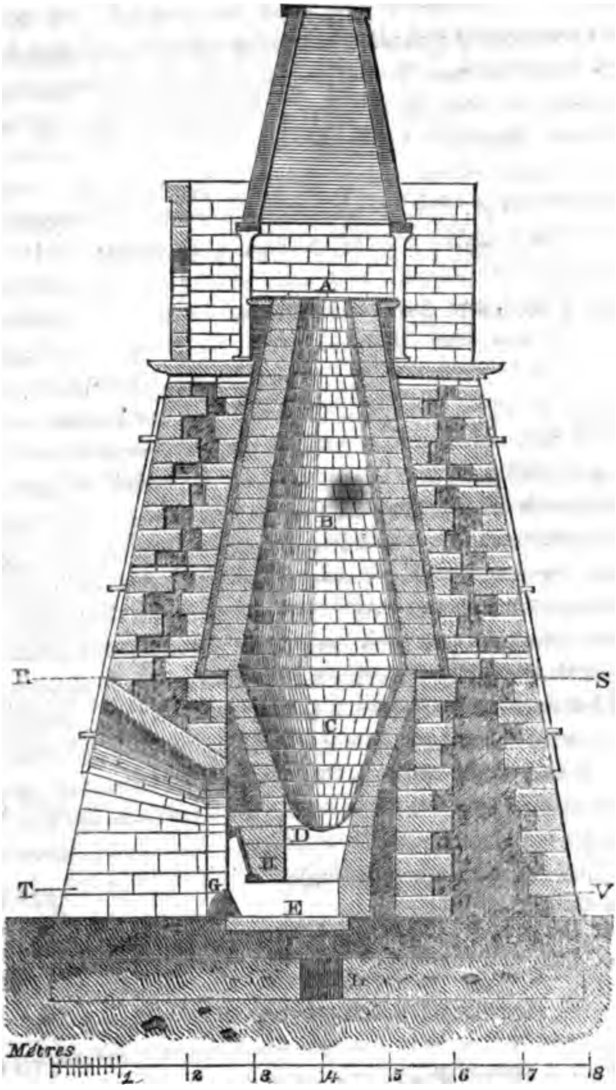
Respectfully yours,

SAMUEL HUSE & CO.

The following wood-cut shows a vertical section of an Iron Furnace, in which the ore is smelted by means of charcoal. It is 30 feet high from the hearth to the trunnel head, and 9 feet in diameter across the boshes. The lining is made of fire-brick, between which and the masonry of the stack, there is a layer of fine charcoal and sand, rammed into a space left for the purpose. Spaces are left also in the masonry of the stone

work, which are filled with sand. Clamps made of iron bars bind the work together. The scale of French metres gives the proportions of the various parts of the furnace, a metre being 3 feet 3.37 inches.

FIG. 5.



A. Trunnel-head.
B. C. Interior of the furnace.
D. Entrance of the Tuyere for the blast pipe.
E. Hearth.
G. Vent for drawing off the iron.
H. Dam for casting.
R. S. Section across the boshes.
T. V. Line of section across the hearth.

A gentleman in Boston, well acquainted with iron works, has furnished me with the following statistical observations respecting the expenditures and profits of iron furnaces.

In Vermont near Troy, there has been lately established a large blast furnace, by which three tons of cast iron are obtained per diem from the granular magnetic ore of that town.

The charcoal used each day amounts to 600 bushels, and costs per bushel 4 cents,		$24 00
Cost of ore and flux for 3 tons of iron—$10 per diem,		10 00
Labour, $10,		10 00
Interest on capital of $100,000, $6 per diem,		6 00
Cost of three tons of cast iron		$50 00
Three tons of cast iron, at $45 per ton, sell for	135·00	
Deduct cost of manufacturing,	50 00	
Profit on three tons,	$85 00	
When two tons are made, the profit is $43 33		

This gentleman also states that the following are the items of expenditure and profit, at the Franconia, N. H., iron works, where magnetic iron ore is also wrought, the average width of the veins being but two feet, from which one man can blast out two tons daily, at the cost of $6 per ton.

Six laborers are employed at the furnace, viz: two top men, who attend to the charge; three fire men, who have the care of the blast, and of the casting; and one gutter man.

Two tons of iron are made each day. Limestone, used for flux, is carted six miles to the furnace.

700 bushels of coal are used daily, costing 4 cents per bushel,		$28 00
Cost of the ore, $6 per ton, 4 tons,		24 00
Cost of flux, and roasting of the ore		2 00
Labour of six men		10 00
Interest on capital, and contingencies,		6 00
Cost of two tons of pig iron,		$70 00
Two tons of pig iron sell at the foundry for	100 00	
Deduct cost,	70 00	
Daily profit,	$30 00	

But, in the form of castings, made at the works, the iron sells frequently for $75 per ton, which would give $80 daily profit. Bar Iron sells for $100 per ton.

I trust that we may soon have a number of smelting furnaces in operation in Maine, and that no longer so large and valuable resources will be allowed to remain neglected, while the State is paying enormous sums of money to England, Sweden and Russia, for her supplies of this indispensable metal.

There are numerous deposits of iron ore in the State, a few of which have already been examined, while I have not yet been able to explore the extent of others. In Clinton, considerable deposits of bog ore are found, specimens of which have been sent to me. The ore is of good quality, but I am not yet aware of its extent. In the town of Williamsburg, 10 miles north from Mr. Greenleaf's house, there occurs a large and valuable bed of bog iron ore. It has also been discovered in large quantities in the town of Argyle. Mr. Curtis has sent me a package of specimens, which are of excellent quality, and exactly like the Shapleigh ore. He informs me that there is an ample supply for a blast furnace, and charcoal may be had for 3 cents per bushel. This locality, being near the Penobscot, and but a few miles from the Oldtown Railroad, can doubtless be wrought to advantage. Water power is found close at hand, and the locality is said to offer every facility required for successful operations. I hope to be able to ascertain the precise extent of the ore early the ensuing spring. Good bog ores are found also at Bluehill, and will, perhaps, be wrought, should the magnetic ores on the neighboring islands be mined and smelted, for the bog ore would mix with it to advantage, and occurs close at hand. There are small deposits of bog ore, also, at Castine; also at Paris, Saco, Jewel's Island and Thomaston. But they do not appear to be of sufficient extent to justify the erection of furnaces. In Lebanon there appears to be an extensive deposit of bog iron ore, which is found in numerous places where the diluvial gravel has been gullied by brooks; there being no forest trees around, it cannot be wrought to advantage. In the town of Union, there

is an enormous bed of this ore, more tha
which occurs near a pond on the side of a
er, contaminated by the presence of a li
only answer for common castings, since
phur renders the iron brittle, and it cann
from it in the furnace. In a former repor
point out many other valuable localities, wl
abundantly, and I beg leave to refer you to
particular description, it being my object
what we have discovered during the presei

The most valuable bed of iron ore wh
the State, occurs on the south side of th
above the house of Mr. Currier, in the t
13, 4th Range, on Coffin's map of the
bed is included in red and green argillace
runs in a N. W. and S. E. direction to
It is 36 feet wide, and was traced by us t
feet, while there is not a doubt that it runs
an immense extent, and probably belongi
as the great bed of Iron ore that I d
Woodstock. Its direction would cause
the township belonging to Williams C
Academy, situate near Houlton, and
found to cut through this town. It is of
dently inexhaustible. Situated upon a gr
er, where a large flat boat may run to the
but one obstruction at the falls, near its r
a carrying place for half a mile, it is evide
be advantageously wrought, not only for t
ritory, but also for the inhabitants upon
Woodstock no less than $120 is paid for a
we can afford to supply them for a less p
than England can produce. This ore y
pure metal, and will give 60 per cent. o
very best kind of ore to smelt, being ea
heavy enough to make a good charge fo
Wrought by means of charcoal, it will yie

ity to the best from Sweden, and capable of being wrought into the finest kinds of cast steel.

Although England exports her own iron, which is of an inferior quality, she is obliged to depend upon Sweden and Russia for all the metal used in cutlery, and no less than $70 per ton is paid by them for the Swedish iron manufactured by means of charcoal.

Iron furnaces will hereafter be put in operation upon the Aroostook, and all the various branches of manufacture, which are the invariable attendants upon such a furnace, will be erected, wherever water power and other suitable conveniences are found. All the implements of husbandry that are made of iron or steel, may be furnished from this mine, which is one of the most valuable in the Union, not only on account of its extent, but also for its situation on the borders of a large river, amid interminable forests, which will supply charcoal for the mere labor of cutting and burning the wood.

I trust, also, that American enterprise and capital will not allow the Woodstock mine to remain a buried treasure, for there is in that town an inexhaustible bed of iron ore, of the best quality, exactly like that upon the Aroostook which yields no less than 53 per cent. of pure iron.

Near our frontier, close to a United States military post, as I before observed, this bed is of national importance, and should it be found to cross our boundary, as I doubt not it does, then it would be one of the best localities in the Union for the establishment of a national foundry of cannon and small arms.

Let our enterprising citizens consider well the importance of this proposal, for not only will the locality become property of immense value to the State and the Union, but the various branches of wholesome industry, connected with the manufacture of iron, will invariably be found to enrich and improve the condition of all classes of persons concerned. If we are to have railroads and great agricultural improvements, let us at least make our own tools and iron bars for the purpose, and not depend upon foreign countries for most important instruments.

Should it come to pass hereafter, that difficulties may arise

between Great Britain and this country, resulting in a declaration of war, would it not be of immense importance to us, to become disfranchised from our dependance upon their foundries, so as to be able to manufacture at least our own weapons of defence? Maine should learn to depend upon her own resources, and such resources she possesses in equal extent with any other country in the world.

Lead ores have been found in several parts of the State, but not in very large veins. The Lubec mines appear to be the most valuable, and may doubtless be wrought to advantage.— Some additional exploration has taken place during the past summer, and it was found, as I had indicated, that the veins widen as they descend. The prospects of the individuals concerned appeared very propitious, until the embarrassments of trade caused a stoppage of their operations, in common with almost every enterprise of the kind in the country.

Besides lead, zinc and copper ores, described as occurring at Lubec, an ore of bismuth has been found, which was analyzed by my friend A. A. Hayes. This ore may be wrought for making soft solder, used by the workers in tin-plate, and it may also be used as a component of type metal.

A small vein of lead and zinc ores has been discovered in the town of Parsonsfield, but not of sufficient magnitude to be profitably wrought. It is, however, an indication of the occurrence of those ores in the vicinity, which should not be overlooked.

Manganese occurs abundantly scattered in the soil of Maine, and in several places forms beds of considerable thickness. In Thomaston, upon Dodge's Mountain; Bluehill, on Osgood's farm; Paris, upon Tuel's estate, and in numerous other places, there are considerable masses of the black oxide of this metal. It is used for bleaching, and for the preparation of oxygen, also for the destruction of vegetable matter in the glass furnace, and for giving a violet color to ornamental glass. The silicate of manganese, composed of silex and the prot-oxide of manganese, with a little iron, all chemically combined, occurs in an enormous bed upon Bluehill Mountain, but although this

mineral is so abundant, I have not yet found out any profitable method of using it in the arts; but as nothing is made in vain, I doubt not that uses will hereafter be found for it, if none exist in the present state of our arts. It forms a bed 36 feet wide, and of great but unknown extent.

Tungsten is found, in combination with iron and manganese, in the mineral called wolfram. It is considered, universally, an indication of tin. This mineral I found near the tide mills at Bluehill, in company with another mineral which also occurs in tin mines—the sulphuret of molybdena. Tungsten is used in porcelain painting and enameling, and this, with some chemical applications, are the only uses known for this substance.

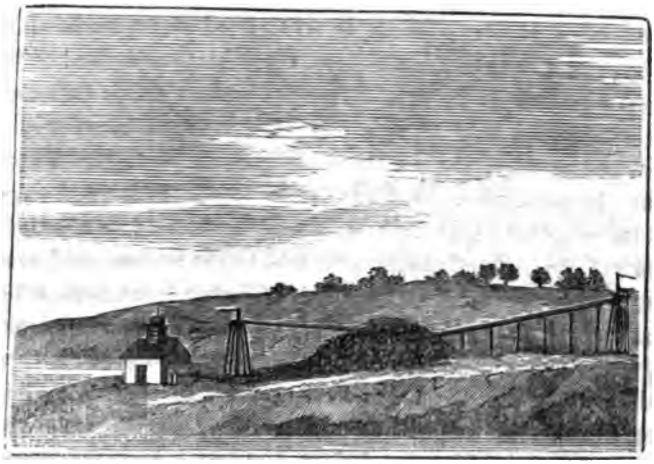
Arsenical iron occurs abundantly in Maine, forming veins in the granite, sienite, and greenstone trap-rocks. This mineral is composed of 46 per cent arsenic and 54 per cent iron, and may be used for the purpose of manufacturing the white oxide of arsenic, which is used in the making of shot. There are considerable veins of this ore at Bluehill, Thomaston and Newfield. It is frequently mistaken for silver, and sometimes for tin ore. When it is roasted in close vessels, metallic arsenic sublimes; and if atmospheric air is admitted, the metal oxidates as it rises, and forms the white oxide, or arsenious acid, a substance well known as a poison. Arsenical pyrites, or the sulphurets of iron and arsenic, also abound, and they occur in veins in granite rocks. On Davis farm, in Newfield, I observed that the rocks dug out in sinking a well, were filled with an infinity of veins of this mineral, and since it decomposes when exposed to the joint action of air and water, sulphuret of arsenic being formed, it may not be altogether safe to make use of water in contact with it, since this mineral is slightly soluble in water, and is poisonous. It can be easily imagined that a complicated case of medical jurisprudence might grow out of an occurrence of this kind, and I beg leave to call your attention to the subject, on that account. I should certainly feel very reluctant in making use of water constantly flowing from rocks charged with arsenic; and although I do not know of any case of poisoning, from such a cause, it is still possible that they may have occurred, unknown even to the sufferers.

Iron pyrites, or the bi-sulphuret of iron, is
abundant minerals in Maine, and is frequently
or silver, according to the color it presents.
distinguished by its crystaline form, which
square prism, nearly approximating the cube,
ical characters, which are readily tested.
with a hammer, it is easily crushed into pow
to distinguish it from native gold or silver, w
When thrown on red hot iron, or upon burni
off an odor of sulphurous acid, and the pow
magnetic, so that it will be at once taken up
or needle. This mineral is composed, in 1(

Sulphur
Iron

When it occurs in large quantities, it is va
in the manufacture of copperas or sulphate o
stance it forms by spontaneous decompositio
ily if slightly roasted by fire and then treatec

The pyritiferous slates of Maine are exce
mineral, and may be made to form both cc
It should always be observed whether the sla
sia or not. If it does, it will act as an al
ble obstacle in the manufacture of alum, sin
of sulphate of magnesia is formed, which rc
manage. On Jewell's Island there is an est
manufacture of these articles, and there, the
considerable proportion of talc (a magnesian
to decompose very slowly, and it is not yet as
the work can be profitably carried on.



Copperas and Alum Works on Jewel's Island.

In Brooksville, opposite Castine, there is a very rich deposit of pyritiferous slate, which may be profitably wrought for copperas and alum. The slate is of the argillaceous kind, and the pyrites is most beautifully and advantageously distributed, it being in layers alternating with the slate, which appears on its cross fracture like alternate leaves of silver and black paper, laid one upon the other. It contains sufficient pyrites to allow of a slight roasting so as to render it easily decomposable. I should think that this rock would give nearly its weight of crystalized salts, and hence the locality is evidently of great value.

When copperas can be made on the sea-coast, advantage may be taken of it to manufacture several other chemical products. Thus the sulphate of iron, (copperas) will decompose sea salt, and form sulphate of soda, which may be crystalized out, and then decomposed by the action of carbonate of lime, when it will give carbonate of soda, an article largely in demand for glass-making, and for the manufacture of soap.

Establishments of this kind have been set up in England, where, I understand a patent has been granted for the process.

In order to manufacture these salts from pyritiferous slate, we have first to break the ore into small pieces, three or four inches in diameter, or even of smaller dimensions. A large

heap of it is then piled up on an inclined plane, made of hard clay, and a little fuel is put into the midst, and fired so as to heat a portion of the ore. The fire soon spreads through the mass, and if a little water is pumped upon it, it burns with increased activity, and the operation goes on rapidly. Then as the decomposition proceeds, more water is poured on, and it takes up the saline matters formed, and runs into a vat at the foot of the inclined plane, from which it is re-pumped upon the heap until the solution is saturated, when it is allowed to run into another vat where the sediment subsides, after which the liquor is boiled down and crystalised. The copperas is separated in crystals, and alum is formed from the remaining liquid, by adding some sulphate of potash. It is yet uncertain whether the Jewel's Island works will prove advantageous to the parties concerned, since the ore is rather poor, but there are many other localities where profitable operations may be carried on.

In case war should take place, we shall be able to extract all the sulphur required in the manufacture of gun-powder from pyrites, and should then be independent of the volcanoes of the Mediterranean. During times of peace, we can obtain sulphur at a lower rate from abroad, than we should have to expend in extracting it from this mineral, for when that substance is produced by natural operations, it is always much cheaper than it can be prepared by the hand of man.

AGRICULTURAL GEOLOGY.

GEOLOGICAL ORIGIN, DISTRIBUTION, CHEMICAL COMPOSITION AND CAPABILITIES OF SOILS.

Considering the vital importance of a correct knowledge of the science and art of Agriculture, upon which man depends for his daily bread, we shall willingly avail ourselves of any information that may throw light upon the principles, by which we are to be guided in praetical operations.

It cannot be concealed that agriculture in this country is far below the standard attained in Europe, and that by their more scientific methods, the French, German and Italian farmers are enabled to raise larger crops, so as to supply us with many articles of agricultural produce, at a lower rate than we have been able to grow them upon our own soil, and this too has been effected by people whose soil costs vastly more than ours.

It is well known, that for several years past, large quantities of wheat, barley, indian corn and beans, have been imported into this country from France, Germany, Venitian, Lombardy, Tuscany and Egypt, while at the same time, orders have been sent out from France for the purchase of our refuse bones; and the bone black of sugar refineries—substances used in that country for improving the soil. Thus, strange as it may seem, the French farmers send out to this country for manure, and supply us with bread, while many remain ignorant of the value of those very substances so eagerly sought for by our foreign brethren!

European science has been brought to bear upon the art of agriculture, and hence the improvements are rapidly progressing there; while we have as yet done but little towards the developement of this most important of arts.

I know that many intelligent farmers decry "book farming" as useless, and their remarks are certainly worthy of our attention, and we may perhaps remove their objections. Good books on this subject record the experience of many excellent

practical farmers, and concentrate all the information that is scattered in various parts of the world; while at the same time they give general rules by which we are to be guided in practice. Where then is the objection that has been raised against such knowledge? It will be found that there are few such books in existence, although there are materials enough on record to furnish a good treatise, and those books that have appeared, are deficient in some of the most essential particulars, or they are so technical that those who are unacquainted with the elements of science cannot understand them. There are also imperfections in the certificates and rules, owing to no analysis having been made of the soils in question.

So also our own farmers are unacquainted with the composition of their own soils. Hence we account for the uncertainty of the results obtained by those who make trials of new methods in farming, and we ought not to be surprised at their frequent failures.

If, however, all the conditions of the problem were understood by both parties, farmers would readily join hands with their scientific co-laborers, and the art of agriculture would soon become as certain as any other art, while, by the application of scientific principles, the business would become of a more exalted character, and assume its true rank in the consideration of all men.

In order to make rational experiments in farming, it is essential that the composition of the soil should be known, and then we can act understandingly in our operations. In order to amend a soil, that knowledge is absolutely necessary, otherwise we might destroy its fertility, by the processes intended for its amelioration, and thus be subjected to disappointment and chagrin.

Mineralogy, geology and chemistry come to our aid, and serve to indicate the nature of various soils, while sure indications are readily discoverable for the amendment of those which are sterile.

Agriculture is of so great importance to the community, that we should not allow our knowledge of it to rest upon mere em-

pyricism. It ought to be exalted to the rank of a true science, and then it will become one of the most honorable, as it is one of the most useful of arts, and even the most highly educated men will then be proud to rank as scientific farmers.

Let us now examine the subject more in detail, and ascertain how much light we may obtain from the science of geology, that may serve to guide us in our researches.

We have first to consider the geological origin of soils.

Every attentive person must have observed, that solid rocks, exposed to the combined action of air, water, and different degrees of temperature, undergo decomposition and disintegration, so that they crumble into powder, and that some rocks decay more rapidly than others, owing to their structure, or mineralogocal composition. If a rock is porous, or stratified in its structure, water infiltrates into it, and on freezing, expands with such power, as to tear the surface of the rock to pieces, so that it readily crumbles. When fire runs through the forests, it heats the surface of the rocks, and by the irregular expansion produced, they are shivered into fragments.

The action of running water and friction of stones, also serve to grind the rocks into powder, by attrition of their surfaces, and the detritus is borne along by the streams, and deposited in low lands, or along their borders.

When a rock contains iron pyrites, or sulphuret of iron, that mineral, by the action of air and water, decomposes, and forms copperas, or sulphate of iron, and the sulphuric acid of that substance acts powerfully on some of the ingredients of the rock, and causes its rapid decomposition. Any person, who has been on Iron Mine Hill, in Gardiner, will fully understand how rapid is this operation, and may there see its results. The oxidizing power of the atmosphere, also, acts powerfully upon the surface of those rocks, which have for one of their components, the prot-oxides of the metals, iron and manganese, and as those oxides take up another portion of oxigen, they increase in bulk, become brown or black, and the stone falls into fragments.

These are a few of the causes now in action, which modify

the solid crust of the globe, and it appears that their effects are far more important, than we might at first imagine. Whoever looks upon the muddy waters of the Mississippi, Ganges, Po, the Rhine, and the Rhone, or reads the calculations respecting the enormous quantity of matter brought down from the mountains by those rivers, will at once appreciate the modifying influence of those causes which are continually wearing down the solid matter that forms the mass of our mountains.

Geology teaches us, that such causes were formerly in more powerful operation, and that the ancient world was, from its infancy, subject to violent catastrophes accompanied by powerful inroads of the sea; oceanic currents and tumultuous waves having for many successive periods rushed over the land, and beaten the loftiest crags of the highest mountains. We should then naturally expect, that the earth would present ample testimony of the action of these powerful causes of disintegration of the rocks, and we do observe that a large portion of the loose materials upon the surface, bear proofs of aqueous action and mechanical abrasion. By those ancient convulsions, the detritus of the solid rocks was prepared, and forming the various soils, which we observe, the earth was rendered capable of yielding its rich stores of vegetation, on which a large proportion of the animated creatures depend for their food. From the foundation of the everlasting hills, the CREATOR began to prepare the world for the habitation of his noblest creature, man, and converted a portion of the solid rocks into soils, which were given as the field of human labor, and to the progenitor of our race it was commanded that he should till the soil.

If we take up a handful of earth, and examine it attentively, we shall readily discover such mineral ingredients, as denote the rocks from which it originated. Thus we discover in a soil numerous spangles of mica, grains of quartz, and white or brown earthy looking particles, which are felspar; besides which, we remark a considerable portion of fine brown powder, which being examined with a microscope is found to be composed of the same minerals, more finely pulverised, and mixed with the brown oxide of iron. It will be at once understood,

that such a soil arises from the disintegration and decomposition of granite rocks, and that the oxide of iron was derived from the pyrites, or the prot-oxide of iron, contained in that rock.

A soil arising from the decomposition of gneiss, possesses similar characters, only the mica is more abundant.

Soils from mica slate are made up of a large proportion of mica, mixed with grains of quartz.

Sienite, and hornblende rock, produce a dark brown soil, in which there is but little quartz, and a great deal of felspar, and decomposed hornblende.

Greenstone trap-rocks form by their decomposition a brown soil, which contains pieces of the undecomposed rock, but the component minerals in the soil itself, are rarely so distinct as to be discoverable. This soil is a warm kind of loam, soft and spongy, easily compressed into smaller dimensions by the pressure of the hand, but not adhesive like clay. It is peculiarly adapted to the growth of potatoes, and is a luxuriant soil for most of our ordinary produce.

Slate-rocks form a soil of a blue color, in which numerous undecomposed fragments of the rock may be discovered. When transported by water, it is deposited in the state of tough blue clay.

Limestone forms various colored soils, according to the nature of the impurities it contains. They are generally of a light yellowish brown color, from admixture of a certain proportion of oxide of iron. This is especially the case with those soils derived from the argillo-ferruginous limestone.

Calcareous soils, if they are rich in carbonate of lime, may be distinguished by their effervescence with acids, and the quantity of this substance may be estimated by the loss of weight which indicates the proportion of carbonic acid, that has been expelled, and since the carbonic acid always occurs in the ratio of nearly 44 per cent. to 56 per cent. of lime, it is easy, by a proportional calculation, to ascertain the quantity of that mineral in the soil.

It more frequently happens, that there is so minute a quantity of carbonate of lime in the soil, as to require a minute chem-

ical analysis for its detection, and few farmers have either leisure or means for such an operation. Examples of such analyses will be presently laid before you.

Talcose slate-rocks, when decomposed, form a light brown soil, in which particles of the rock are discoverable, and on analysis, a considerable quantity of the silicate of magnesia is found, which is one of the chief components of talc.

Red sandstone, on disintegration, forms soil composed almost entirely of grains of quartz, with oxide of iron, and clay, with a few spangles of undecomposed mica.

Grau-wacke, or conglomerate, when disintegrated, produces a light grey soil, full of smooth rounded pebbles, which originate from the undecomposed components of the rock.

Red porphyry is very slow of decomposition, and forms a a bright red fine powder, filled with angular fragments of the rock.

I have thus distinguished and described the appearances which characterise those soils that arise immediately from the decay of solid rocks, and various characteristic specimens of each variety may be seen in the cabinet arranged for the use of the State.

Let us next consider how soils are distributed on the earth's surface, and see how their qualities depend upon their situation.

In various sections of this report may be seen recorded the proofs of diluvial transportation of rocks, far from their parent beds, and we have every reason to believe, that this removal was effected by a tremendous current of water, that swept over the State from the North 15° West, to the South 15° East, and we have adduced in testimony, that such was the direction of that current, numerous grooves, furrows or scratches upon the surface of the solid rocks, in place, and have shown conclusively, that the rocks which we find thus transported, proved to be portions of ledges situated to the North of the localities where their scattered fragments are found.

It is a matter of surprise, that such enormous masses of rock should have been moved so far by an aqueous current; but when it is remembered, that a rock does not weigh but half so

much when immersed in water, as it does when weighed in air, owing to the support given it by the water around ; and when we reflect on the fact, that a rock is still more powerfully supported under the pressure of deep water, it may be conceived, that if a flood of water did once rush over the land, it might have removed large and weighty masses of rock, such as we find to have been the case.

From the observations made upon Mount Ktaadn, it is proved, that the current did rush over the summit of that lofty mountain, and consequently the diluvial waters rose to the height of more than 5000 feet. Hence we are enabled to prove, that the ancient ocean, which rushed over the surface of the State, was at least a mile in depth, and its transporting power must have been greatly increased by its enormous pressure.

It will be readily conceived, that if solid rocks were moved from their native beds, and carried forward several miles, that the finer particles of soil should have been transported to a still greater distance, so we find that the whole mass of loose materials on the surface has been removed southwardly, and the soil resting upon the surface of rocks, in place, is rarely, if ever, such as results from the decomposition of those rocks, but was evidently derived from those ledges which occur to the Northward.

If an attentive observer examines the soil in the city of Portland, he will discover, at once, that it is made up from the detritus of granite and gneiss rocks, while the ledges in that city are wholly composed of the argillaceous, talcose, and mica slate-rocks, and granite and gneiss occur in great abundance to the Northward.

All the markings on the surface of the rocks, and the scattered boulders of granite and gneiss, which abound in that soil, indicate its origin to have been in the North 15° or 20° West. I merely quote the above locality, on account of its being a spot were most persons will have occasion to examine the facts stated. The various sections of the State present ample illustration of the same fact, and every one who will take the trouble, may convince himself of its reality.

The tertiary deposits of clay, sand and marine shells, were evidently produced in tranquil water, since their strata indicate, by their situation, structure and beds of shells, that the clay was gradually and slowly deposited, allowing time for the propagation and growth of the various shell fish in its several layers. Not so was the diluvial matter deposited, for we find it to bear marks of sudden and violent transportation and deposition, the various pebbles, boulders and erratic blocks of stone being mixed in great confusion. I have formerly mentioned a locality, in Bangor, near the court-house, where, it would seem, there are proofs of a gradual subsidence of the diluvial current, the various particles becoming smaller, as we ascend the embankment, until we come to fine clay, which must have subsided from tranquil water.

We observe, then, that the tertiary deposits were cut through by the diluvial waters, which have excavated deep vallies, and heaped up long ridges called horse-backs, and the general direction of these vallies and ridges, coincides with the direction formerly indicated, as the course in which the current swept.

Although we are informed in the scriptures, that the Deluge was ordained for the punishment of wicked men, it is certain, that there was mercy mingled with this dispensation, for the soils were comminuted, transported, and mixed in such a manner, that their qualities were improved, and rendered more suitable for the growth of plants, so that the surface of the globe was not only purified, but new and more fertile soils were prepared for coming generations, who literally *reap* advantage from the Deluge.

Besides the ancient aqueous current, we see every day the action of water modifying the surface of the globe, transporting fine particles from the mountain-side, and depositing them in the valleys and along the margin of running streams. Especially during freshets, when the rivers burst their narrow confines, and spread out over the intervales, do we see rich deposits formed of *alluvial soil.*

Such currents, arising amid decomposing vegetable matters, transport an infinity of fine particles of such matter, and depo-

sit it with the various earthy ingredients, which form our richest meadows, and luxuriant intervale soils. Thus are formed many of those bottom lands, which occur along the river courses of the Western States, and the banks of rivers in Maine, under similar circumstances, are found to be composed of like soils.

A river, coursing its way amid various rocks, carries down and deposits fine particles of every kind, which it meets with in its way.

If the rocks above are limestone, we shall have calcareous soil brought down and deposited by the river. So on the banks of the Aroostook, we find a rich alluvial soil, equalling in fertility the famed regions of the Western States, and capable, even under a less genial clime, of producing crops of wheat and other grain, fully equal in abundance with any soils of which we have any records.

That river, with its wide and fertile intervales, is destined to become the granary of the North, and whenever the policy of the State shall complete the roads, and offer facilities for settlement, we shall turn the tide of emigration, populate a fertile district, and I trust forever place that portion of Maine beyond the power of foreign aggression.

Soils are powerfully modified by the circumstances under which they are placed, and it will be useful to consider, how this may be affected by their order of super-position.

I have had occasion to examine two portions of a field, in the town of Saco, where the superficial soil was uniformly composed of a light brown sandy loam, and in one part of that field, the Indian corn growing upon it, was tall and luxuriant, while on the other, it was short and feeble. The several parts of this field were treated with the same kind of manure, and planted with the same grain, in the same manner, so that their circumstances were apparently alike. On searching into the cause of this difference of fertility, it was discovered, that in the luxuriant part of the field, there was a deposit of clay, from one to two feet from the surface, while in the other, it was four feet below. Hence it would appear, that in the first instance, the clay serv

ed as a retainer of moisture and of manure, while in the other, these indispensible requisites for healthy vegetation, sank beyond the reach of the corn. The remedy was at once apparent, for it was only necessary to mix clay with the barren soil, to make it retentive.

It frequently happens, also, that we observe a farmer toiling upon a tough clayey soil, which it is in vain for him to attempt to keep loose, for with the first rain, the clay is washed down into a slimy paste, which by the ardent sun-beams, is soon baked into an impermeable mass, which prevents the free germination and growth of the seed. Now, hard by, occurs a hill of sand, that nature seems kindly to have placed at his disposal, and he is only required, after ploughing his clay soil, to cart a quantity of sand into the furrows, and harrow it in, in order to produce a soil of good texture, which may then be manured as required, and will produce well. In such cases, the sand may be added every year, until there is a sufficiency. Such soils are highly retentive of manure, and are worth the labor of reclaiming, and I should denote the neighborhood of Bangor, as a suitable field for such improvements; and I doubt not, that the market of that city would, by its demand, amply repay the labor and money expended.

CHEMICAL COMPOSITION OF SOILS.

From the mineral ingredients we may form some idea of the chemical nature of the soils, but since there may be many matters mingled, in the state of fine powder, not capable of discrimination by the eye, and those very substances may be the cause of its peculiar properties, it becomes necessary to resort to the aid of chemical science, and analytical art for their detection.

It is a strange and almost unaccountable fact, that while we have the most minute and delicate analysis of rare and curious minerals, chemists have either neglected to ascertain the composition of soils, or have satisfied themselves with the most crude and careless examinations, that do not answer the purpose intended.

The late illustrious chemist, Sir Humphrey Davy, was called upon by the British Agricultural Board, to give a course of lectures upon the chemical composition of soils, and the modes of amending those which were sterile, and his lectures contain nearly all the information attainable by the farmer respecting the composition of soils. Although Davy's Agricultural Chemistry is as good an essay as we had a right to expect when the art of chemical analysis was in its infancy, and a vast deal of valuable information is contained in it, still the analyses are so imperfect, that they neither serve to distinguish one kind of soil from another, possessing altogether different properties, nor serve to indicate such ameliorations as are required. When Davy acknowledges that his errors in the analyses amount to 5 or 10 per cent, we must feel convinced that either sufficient care was not taken, or that the instruments of analysis which he used were not sufficiently exact. We shall see in the analyses that I shall present, that an error of even one or two per cent, would cause an utter failure in respect to the information desired, and shall at once perceive the importance of the most scrupulous exactness in the operation.

Chaptal has also given us some chemical essays upon agriculture, but the analyses of soils are generally borrowed from the work of Davy. It contains, however, much valuable information respecting several different departments of the art, and a special treatise upon the cultivation of beets and making of sugar. This essay has been translated into English, and is worthy of the farmer's attention.

The chemical analysis of soils is one of the most difficult and tedious operations the chemist is called upon to perform, and it seldom happens that the processes are completed within three weeks from the time they were commenced. Hence the necessity of my carrying on a number of analyses at a time, in order to be able to present them in season for this Report. By operating on three or four specimens at a time, the chemist is kept continually employed and an extensive supply of apparatus is put in requisition, since the processes multiply with astonishing rapidity, and soon every vessel in the laboratory

finds occupation, and it is necessary to label each glass, funnel or filter as he proceeds. Attempts have been made to render the art of chemical analysis easy, so that farmers might be able to do them for themselves, but such attempts have been entirely abortive, for it would presuppose a knowledge of chemical science and manipulation rarely if ever in possession of any but professed chemists, and it would be idle to put instruments and reagents into the hands of those who do not know how to use them. It would certainly be very useful to the community, if our agricultural bretheren would establish a college or institute, devoted exclusively to those arts appertaining to agriculture, and such institutions will ere long be founded in each of of the States, for we begin to see and feel the importance of a good scientific education among the farmers throughout our country, and our young men ought to posses advantages so desirable and important for their welfare and prosperity. It is evident that small schools will do no good, since they would not be sufficiently well endowed to command the services of scientific teachers, and hence if the attempt is made, let there be one large and well endowed agricultural college in each State, connected, if found practicable, with the usual classical institutions, and forming a branch of each university. Many, who do not desire to spend years in the study of Latin and Greek authors, are still anxious to learn the elements of those sciences which appertain to their professions, and I have not the least doubt that a well ordered and scientific agricultural institute would prove one of the most popular and useful schools in the country. In such a college, mathematics, drawing, surveying, mechanics, architecture, chemistry, mineralogy, geology, zoology and the practical arts, each in their several departments, might be taught by study and lecture, while every practical operation should be learned by actual practice. I leave it to your good judgment to say if such an institution is not desirable, and if you desire its establishment you have but to say so and it will be done, and Maine will bear the palm of having founded one of the most useful institutions of the country.

MECHANICAL AND CHEMICAL ANALYSIS OF SOILS FROM MAINE.

Much information may be obtained by mechanical separation of the various particles of soil, and such I have made one of the preliminary steps in the operations of analysis.

Three different kinds of sieves were selected, the first of which has meshes $\frac{1}{12}$ of an inch, or one line in diameter, and is made of copper wire. The second is a sieve of nearly double the fineness of the above, having openings of the meshes $\frac{1}{30}$ of an inch. The third is a very fine gauze sieve, with openings not more than the $\frac{1}{50}$ of an inch.

By sifting the soil, we can then obtain four different divisions of the particles, which I divide into different grades, beginning with the coarse matter left on the sieve No. 1, and so on.

After these operations the next is to be effected by agitating the finest soil which passed the fourth sieve with a quantity of water, and then pouring off the suspended matter from that left at the bottom after $\frac{1}{2}$ minute's repose. This gives us two other degrees of fineness or the fifth and sixth divisions.

One thousand grains of each specimen was taken for each analysis, and each proportion of divided matter was weighed in the balance. For example, let us take a specimen of a soil from Maj. Stone's farm, in Waterford, taken from his luxuriant wheat field, six inches from the surface.

This soil is of a yellow loam of mellow texture and remarkably fertile, having on it a crop of wheat, which will probably measure more than 30 bushels to the acre. This soil had been limed four casks to the acre, and was also manured from the barn-yard to a small extent. One thousand grains divided as follows—

No. 1—does not pass the coarse sieve, and consists of gravel derived from granite rocks, sticks and roots. No. 1=175 grains.

Does not pass 2d sieve—fine sand and vegetable fibres. No. 2=240 grains.

Does not pass the third sieve—No. 3=20 grains.

Fine powder which came through
=565 grains.

No. 1=	1'
2=	2
3=	
4=	5
	10

This fine powder, agitated with a p
off in 30 seconds, left fine sand. No.
pensible. Matter suspended, No. 6=

This will give an idea of a mech
These operations show the texture an
materials, which throws great light up
ties.

*Chemical Analysis of soil from Ma
terford.* One hundred grains of the
gave the following results:

Water,
Vegetable matter,
Silica,
Alumina,
Oxide of Iron
Oxide of Manganese,
Phosphate of Lime,
Carb. Lime,

This soil is remarkably productive,
cultivation.

*Analysis of soil from the farm of
Saco.* This soil yields 40 bushels of
a yellow, sandy loam, and was evident
rocks. One thousand grains, by mec
The degrees of composition as per m

1st, sticks and roots,
2d, coarse gravel,
3d, fine gravel,
4th, fine sand,
5th, fine powder, &c.

...ne powder there are—

...er suspensible in water,	122
...tter not suspensible,	780
...egetable matter which floats on the surface of water,	23
	925

Alluvial soil, Hooper's farm, Aroostook River. It is a fine yellow loam, very luxuriant and productive of wheat, potatoes, &c.

Mechanical analysis—

1st degree,	0
2d, vegetable fibres, and coarse sand,	4
3d, " " fine sand,	9
4th, very fine loam,	987
	1000

Chemical analysis gives the following results—

Water,	4.9
Vegetable matter,	4.0
Silica,	76.0
Alumina,	5.0
Per ox. iron and alumina,	10.9
	100.9

In 100 grains there are—

Insoluble matter,	77
Soluble "	23
	100

Soil of Phipsburg Basin, Dea. Hutchins' farm. Mechanical analysis on 1000 grains—

1st deg. of fineness, veg. fibres and pebbles,	50
2d " "	90
3d " "	40
4th " "	920
	1000

Chemical analysis of 100 grains—

Water,	6.5
Vegetable matter,	11.5

Silica,	60.0
Manganese,	4.0
Alumina,	11.0
Ox. Iron,	2.0
Lime,	1.0
Potash,	1.0
Magnesia,	3.0
	100.0

Analysis of soil from Dodge's Mountain, Thomaston. Dark red brown color; growth, black-oaks, grass, rye—luxuriant. Rocks around manganesian mica slate.

Mechanical analysis—

1st, particles of slate, pebbles and little pieces of manganesian slate,	206
2d silicious gravel,	I75
3d, fine sand,	10
4th, very fine powder,	609
	1000

Chemical analysis on 100 grains of the fine powder—

Water,	6
Vegetable matter,	13
Silica,	51
Alumina and Magnesia,	15
Ox. Iron,	12
Manganese,	6
	101
Gain from moisture,	1
	100

Wiscasset. Soil remarkable for the excellence of its potatoes.

Mechanical analysis of 1000 grains—

1st	degree of fineness, veg. fibres and sticks,			10
2d	"	"		10
3d	"	"		20
4th	"	"	fine mould,	960
				1000

Chemical analysis on 100 grains of the fine powder—

Water,	4.0
Vegetable matter	10.0
Silica,	58.0
Alumina,	14.0
Magnesia,	12.0
Ox. Iron,	2.0
	100.0

Chemical analysis of fine alluvial soil, of an ash grey color, from the Oxbow, of the Aroostook river, not cultivated—

Water,	8
Vegetable matter,	5
Oxide Iron,	3
Alumina,	20
Silica,	61
Carb. Lime,	2
	99
Loss,	1
	100

Analysis of soil from Fairbanks's farm, Presq' Isle river, near the Aroostook; yellow loam, mellow, not adhesive; no stones in it; produces 35 bushels of wheat the acre.

Water,	4.0
Vegetable matter,	4.5
Ox. Iron,	4.5
Silica,	76.0
Alumina,	10.0
Carb. Lime,	1.0
	99.5
Loss,	5
	100.0

The black vegetable mould upon the surface of this soil contains 26 per cent of vegetable matter, and the remainder is yellow soil, like that above reported. This vegetable matter, when treated with boiling water gives 5 grains of vegetable extract which possesses the properties of *ulmine.*

Soil from Peter Bull's estate on the Aroostook river.

Mechanical analysis of 100 grains—

1st, pebbles,	525
2d, fine sand,	330
3d, " "	25
4th, fine powder,	130
	1000

CAPABILITIES OF SOILS—VEGETABLE PHYSIOLOGY.

It is evident that plants are not endowed with creative powers, and consequently are unable to produce any new elementary substances; hence the various substances which enter into their composition, must be derived from the air, water or earth. All the saline and earthy matters which they contain are readily traced to their origin in the soil; while the carbon, hydrogen, oxigen and nitrogen that exist in them, are elements which they draw from air, water, and the animal and vegetable substances used as manures.

The atmosphere is composed chiefly of the two gasses, nitrogen and oxigen, mixed together in aeriform solution, in the proportion of four-fifths nitrogen, and one-fifth oxigen, besides which gasses there is always a certain proportion of carbonic acid gas, amounting to $\frac{1}{10000}$ part, and variable proportions of aqueous vapor.

From the carbonic acid gas of the atmosphere, plants derive a large share of their carbon, which is the basis of all vegetable matter. Some of it is also furnished by the fermentation of vegetable and animal substances, which decompose in the soil, and this gas is either decomposed by the leaves of vegetables, or is carried into their roots by aqueous solution and absorption. All fresh growing plants decompose the carbonic acid of the air, take up its carbon, and exhale oxigen gas, and this operation goes on more rapidly while the sun shines upon them. In darkness, plants give out carbonic acid, but the quantity is relatively small, when compared with that which they absorb during the day. So that if a plant is grown under a bell glass, containing air mixed with this gas, the carbonic acid is soon removed, and replaced by pure oxigen.

Thus vegetation is continually removing a substance deleterious to man and all animals, and replacing it by pure vital air—a gas absolutely necessary for their respiration. This beautiful law of nature should never be lost sight of by the farmer, nor should he ever forget the relation which the green woods and fields bear to the healthfulness of the country.

Seed will not germinate, without the joint action of air, water, light and heat. Without these essential conditions, the germ remains, as it were, asleep for an unknown length of time. Seeds, taken from the tombs of ancient Thebes, in Egypt, where they had remained in a dry, dark and sequestered spot for more than three thousand years, were found still to possess their vital properties, and when planted in a botanical garden in London, sprang forth, to flourish in the present age. How long a seed, thus immured in darkness, shut out from all the causes which would produce germination or decay, would remain alive, is wholly unknown; but from the known facts respecting spontaneous rotation of crops and of forest trees, it would seem that the seed remain buried in the soil for enormous lengths of time, before the circumstances necessary for their putting forth, arrive. Dead leaves of the forest shut out light, and preclude, in some measure, the influence of the atmosphere, while the sombre foliage hangs over the soil, and serves, by its shade, as an additional cause preventing germination. Thus, I suppose, the seed, buried in the forests, remain dormant until the removal of the shade trees, or the burning of the leaves, gives free access to the causes requisite for germination and growth of the hidden plants; and we consequently perceive a new growth almost invariably follows the removal of the primeval forests. According to Decandole, plants exude from their rootlets certain substances, which have the property of eventually eradicating their own species, while they are not preventive of the growth of other plants; hence he accounts for natural rotation. It is probable, also, that one kind of vegetables may exhaust their proper nutriment, and thus render the soil incapable of supporting their kind, while there are other principles left, suitable for the support of different species. This subject is, how-

ever, the most obscure departments of vegetable physiology, and one which demands the labor of modern chemists and botanists. Thus much we know, that the conditions above stated are essential requisites to healthy vegetation, and that the soil must furnish certain substances not attainable alone from air and water. When we analyze a plant, we always find a certain quantity of silex, alumina, lime and potash, forming a large proportion of the ashes which is left on burning the plant. All these matters are contained in the soil, in greater or less proportions, and some of them are essential to the growth of the plants. The coating of wheat, rye and barley straw is silex, and gives the necessary strength and hardness to the stalk.

The analysis of the grain of wheat gives a large proportion of the carbonates and phosphate of lime, and we know that this grain only thrives upon a soil containing calcareous matter. It was long ago observed in Massachusetts, and is also seen in certain districts in Maine, that wheat straw grows very well, but the grain does not fill and present a plump and solid appearance, but looks wilted, and is not heavy. This was formerly supposed to be owing to the climate, but on more careful examination, it is found to arise from the want of lime in the soil. Many animal manures contain a little of this substance, and it accordingly appears, that where a farm is well manured, that wheat will grow well upon it, but a large annual expenditure is required for the purpose. It is observed, that all the grain regions of the country have soils more or less calcareous, and we find, that by adding lime to the soil, we may produce by art the material wanting; and it appears by the analyses here presented, and by the results of certain experiments, which have been made in France, and repeated here, that a very minute proportion of lime is amply sufficient for the purpose. Thus one or two per cent of carbonate of lime will answer the purpose, and this small quantity costs so little, that any farmer can well afford to apply it to the soil. Indeed, I do not see how he can afford to do otherwise, since he will be a loser, and his more skilful neighbors will be enabled to supply the market, while he will not be able to recover his seed.

It is a great mistake to suppose, that wheat will grow in any soil, for I know, that in many instances, the crop raised the past season, which has certainly been very propitious, did not equal in value the seed sown; and these instances all occurred where the soil was destitute of lime, and was not largely manured.

Unless you wish to waste your labor upon barren and unproductive fields, attend carefully to the nature of your soil, and supply those elements which are wanting, in order to render it fruitful.

When lime is moistened with water, it becomes hot, swells, and falls into a bulky white powder, called by chemists the hydrate of lime, it being composed of water combined with that substance in a solid state. This powder, if the lime is of good quality, will amount to nearly three times as much as before it was slaked, so that one cask of lime will fill three casks with the hydrate, or water-slaked lime. If, on the other hand, the lime is exposed to the action of the air, it will attract carbonic acid gas, and become air-slaked, which operation re-converts it into its original chemical state. The hydrate also attracts carbonic acid from the air, and is likewise converted into the carbonate, which will weigh nearly twice as much as the quick lime, from which it is made.

I mention these evident facts, in order to assure the farmer, that when he buys a cask of lime, it will make about three of the article which he uses as a manure, and consequently, that it is not so expensive as he might imagine, since it increases in bulk, and will cover a considerable surface. Moreover, by a skilful management, the farmer may, by the use of lime, form a vast number of valuable composts, and may destroy, or not, as he pleases, the seeds and insects in his compost or barn manure. It also has the power of decomposing animal and vegetable substances, the extent of which operations, a skilful hand can regulate at will, and a great variety of valuable saline compounds, the most active of manures, may be formed. There are are many cases, also, where the combining power of this substance can be taken advantage of, in the neutralization or re-

moval of deleterious matters, and by judicious management, those very principles may be converted into valuable manures.

The following table shows the relative strength of several different kinds of limestone found in Maine during the past season; 100 grains being the weight of each stone analysed.

Locality.	*Kind of rock formation.*	*Insoluble matter, per cent.*	*Carb. Lime per ct.*	*Quantity pure Lime pr ct.*
Buckfield,	Beds in gneiss resting on gran. rocks,	49.	51.	28.71
Winthrop, Mr. Boll's farm,	" "	43.	57.	31.94
Hallowell,	" "	42.	58.	32.60
Newfield, impure kind,	" "	26.	74.	41.10
" purer, Davis' farm,	" "	19.	81.	45.41
Norway,	" "	38.	62.	34.80
Bluehill,	" "	31.	69.	38.70
Paris,	" "	18.	82.	46.12
Whitefield,	" "	5.	95.	53.50
Union,	" "			

It is a common practice among farmers to make use of peat, pond mud, or muck, as they call it, and I have observed instances in which it was evident that the soil was greatly injured by its application. In one instance, I observed in Waterford, that a portion of the field on which this substance was placed, presented a dwarfish and sickly yellow crop of Indian corn, while that part of the field, not treated by it, was covered with a most luxuriant and healthy growth of the same corn. The operation was tried experimentally, in order to ascertain the value of peat alone as a manure.

If it had first been made into a compost, with animal manure and lime, it would have presented very different results. Lime alone on peat merely renders its acid properties inert, and then it answers pretty well as a manure. But if laid down in layers with barn-yard manure, night soil, dead fish, or any other animal matter, and then each layer is strewed with lime, a most powerful fermentation will take place, and a vast quantity of ammonia will be disengaged, which combining with the ulmic acid of peat, will form ulmate of ammonia, a most powerful manure. Carbonate of ammonia, and many other salts, will also result, which convert the whole mass into the very richest kind of manure, forming what may be properly called a universal compost.

If the farmer is desirous of destroying the seeds and insects

in barn-yard manure, let him heap it up in alternate layers, with fresh quick-lime, and the heat generated will effectually destroy them. This operation produces a number of soluble salts, and therefore it should only be done, where the manure is soon to be used, for the rain would remove them in solution.

If a soil is charged with sulphate of iron, it is best to use quick-lime in powder sprinkled on the surface of the soil, for its action is the more rapid and powerful. Generally, however, it is proper to slake the lime with water, and then to expose it freely to the air, in case it is to be sown broad-cast, so that it may become carbonated, which renders it more permanent, it being less soluble in water.

In general, it may be stated, that about four casks of lime are required for each acre of land, and according to the experience of M. Puvis, this quantity, in many cases, was found amply sufficient. If the soil is loose and sandy, without any clay bottom near the surface, it is evident that annual renewals will be required, until the desirable quantity is obtained.

The following tables shew the amelioration of soils in France where liming has been very successful; and where it has been found that 3 per cent of lime in the soil, was amply sufficient to render it extremely luxuriant. It will also be remarked that the beneficial effects of this treatment were even more strongly marked on the rye crops than on those of wheat. It is found also, that lime succeeds best when used in a compost of animal and vegetable matter, and where this method is pursued, the soil becomes annually richer, instead of being exhausted.

	Table of product of the domain of La Croisette.				*Table of product of the domain of La Barronne.*			
YEARS.	RYE.		WHEAT.		RYE.		WHEAT.	
	Seed.	Product.	Seed.	Product.	Seed.	Product.	Seed.	Product.
1822	110	600	24	146	110	505	22	180
1823	110	764	24	136	110	643	22	138
1824	110	744	24	156	110	662	24	149
1825	107	406	27	251	102	398	32	252
1826	106	576	28	210	110	612	32	187
1827	100	504	30	249	107	546	34	204
1828	90	634	36	391	98	696	33	243
1829	82	538	48	309	84	608	40	268
1830	60	307	60	459	91	389	59	374
1831	78	350	40	417	92	411	40	295
1832	55	478	68	816	70	512	80	649
1833	61	529	52	545	75	511	51	471

Marl may be used in the same manner as air slaked lime, and it is found to possess similar properties. Sea-shells may be used when broken to pieces by the action of fire, or by frost, and great benefit is gained by such a dressing. Shells owe their fertilising properties to the carbonate of lime, of which they are chiefly composed, but their compact texture requires to be broken down in the manner alluded to.

Burnt bones contain a small quantity of carbonate, mixed with a large proportion of the phosphate of lime, and may be advantageously used. Bones ground to powder have also a very powerful and desirable influence, forming one of the most valuable top-dressings with which we are acquainted. The refuse bone black, from sugar refineries, is also extremely powerful, and is one of the warmest and strongest manures known. It is highly prized in France, and I have formerly mentioned the fact, that orders were even sent to this country for this article. It may be made into a compost with other matters, since it is too strong to be used alone.

Gypsum is said to operate well as a stimulant to vegetation, and acts powerfully where the the soils are calcareous. In Pennsylvania, it is sown broad-cast upon their limestone soils, and operates powerfully, favoring the growth of grain and grasses. In Maine, it is the general opinion of farmers, that this mineral does not succeed upon the sea-coast, while it answers a good purpose in the interior of the State. I am not yet prepared, however, to report upon the subject, since I have not been able to gather the requisite number of facts.

I will venture to say, however, that gypsum will prove an advantageous dressing to the soils near Houlton, New Limerick, and along the whole course of the Aroostook, while, if it should be required, the Tobique river, opposite the mouth of the Aroostook, contains upon its banks an inexhaustible supply. It will, however, seldom be necessary for many years to apply any manures to the Aroostook soils, for the farmers there only complained that the soil was too rich at first, and when reduced by several years cultivation, was more easily managed. I have no doubt of the truth of this observation, for upon Mr. Fair-

banks' farm, on that river, I observed gigantic wheat stubble, one straw of which measured $1\frac{1}{3}$ inch in circumference, and Mr. F. remarked that new crops were frequently *laid* by their weight, before they were ready to reap.

I have no doubt, that in the course of time, it will be found advantageous to burn the Aroostook limestone, for the treatment of the soils, where they are devoid of it, and every advantage is there presented for this purpose.

The limestone of Newfield, Norway, Paris and Buckfield, may be advantageously used for manure, and can be burned by means of peat or wood. On the sea-coast it will be more economical to purchase Thomaston and Camden lime, unless it should be found, that lime-burning can be carried on on a large scale by means of peat or hard coal.

There are so many localities of peat in Maine, that I hardly have thought it necessary to describe them, but I would, however, point out the localities.

1st. On the rail-road route in Bangor.

2d. At Bluehill.

3d. Near the Marsh quarry in Thomaston.

4th. In the town of Limerick, in York County.

5th. In the town of Waterford, in Oxford County, on the Coolidge farm.

These localities are among the most abundant, and may be most advantageously wrought for fuel, which may be used for the burning of lime and for domestic use, besides which it may be converted into a powerful manure, adapted admirably for loosening and enriching clayey soils.

Artificial meadows formed upon the surface of a peat bog, are always exempt from drought, and they are remarkably fertile. They may be made by carting soil upon them, and will amply repay the labor. Any person who is desirous of seeing a fine example of an artificial meadow of the kind I have mentioned, is referred to the rich farm of Benjamin Bussey, Esq. Jamaica Plain, Roxbury, Mass., where that enterprising agriculturalist has formed an almost evergreen meadow, of the kind alluded to above.

I may remark in general, that all the soils between Bangor and the mouth of the Kennebec, evidently need liming to greater or less extent; and the vicinity of Richmond, Gardiner, Vassalborough, Unity and Dixmont, evidently would be highly improved by its judicious application.

When we have learned by chemical analysis, the composition of the most remarkable soils of the State, we may be enabled to give specific directions for their amelioration.

Much light may be gained respecting their relative fertility, by the agricultural returns made under the orders of the Legislature, and if due attention is paid to the filling of the blanks, sent out to the treasurers of the various towns, we shall have an admirable statistical view of the relative value of the various soils in different parts of the State.

It will be useful to send out printed blanks for other kinds of produce besides wheat, so that we may learn what are the present agricultural capabilities of the State, and in another year we can furnish more extended and accurate information on this very important subject.

Geology and chemistry are capable of furnishing powerful aid to the farmers, and if we are allowed sufficient means to accomplish the work in a satisfactory manner, immense benefits will necessarily accrue to the citizens of Maine.

Respectfully submitted,

By your obedient servant,

C. T. JACKSON.

	DATE DUE		